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# AN ECONOMIC STUDY OF FARM LAYOUT

A THESIS

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF CORNELL UNIVERSITY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

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WILLIAM IRVING MYERS

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AN ECONOMIC STUDY OF FARM LAYOUT

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# AN ECONOMIC STUDY OF FARM LAYOUT

W. I. Myers

The investigation reported in this memoir had two objects. The first was to study the principles of farm layout, and determine their relative importance as an aid to individuals in rearranging their farms to secure the most efficient use of labor and land; the second was to study the utilization of land on the typical farms considered, as a public problem of land utilization, with particular reference to the possibilities of increasing the area of crop land to meet the needs of an increasing population.

Labor efficiency has always been the keynote of American agriculture. American farmers have wasted land but they have produced more product to the worker than any other farmers in the world. They have economized in labor, which was scarce, and wasted land, which was plentiful. The good free lands in North America are now practically exhausted and the pinch of land scarcity is beginning to be felt.

The future problem of American farmers is more difficult. It involves a better utilization of land, a greater intensity of cultivation, and, at the same time, the maintenance of a high productivity per worker. The last requirement is perhaps the most important, for, unless a high productivity per worker is maintained, the agricultural class will become a peasant class similar to that of European countries. Farm layout offers one means of saving land and labor. A properly planned farm layout should make the most advantageous utilization of the land, and at the same time secure the greatest efficiency of labor.

## LOCATION AND DESCRIPTION OF FARMS STUDIED

For several years the Department of Farm Management of the New York State College of Agriculture has been conducting cost-accounting investigations on New York farms, in cooperation with the Office of Farm Management of the United States Department of Agriculture.

Author's acknowledgments. These studies were made under the direction of Professors G. F. Warren and K. C. Livermore, of the Department of Agricultural Economics and Farm Management at Cornell University. Messrs. L. E. Harvey and C. V. Noble assisted in mapping the farms. Surveying instruments were furnished by the Department of Rural Engineering. The farm maps were traced and lettered by Miss C. L. Garrett, Professor J. E. Reyna, and Professor J. L. Strahan. To these and to all others who have cooperated in the work, the writer is indebted.

Since 1915 annual maps of the farms on which cost accounts were being kept have been made by the writer, primarily to increase the value and accuracy of the accounts. Blue prints of the farm maps were returned to each farmer for his own use. The data for the following studies of farm layout were obtained from these maps, supplemented by information furnished by the farmers and in some cases by data from the cost accounts.

Fig. 67. Location of farms studied

The location of the fifty-three farms considered in these studies is shown in figure 67. Most of these farms are larger than the average farm, their average area being 173.4 acres as compared with an average of 103.2 acres for the farms reported in the state census of agriculture for 1918. Altho larger, better organized, better managed, and more profitable than the average farm, they are all real farms, on which the operator is a laborer.

Most of the important types of farming in New York State are represented among the farms studied. Twenty-four of the farms are located in western New York. These farms are devoted largely to fruit and general farm crops. Some fruit is grown for sale on nearly all of them, while ten are intensive fruit farms. Two of the farms in this region produce truck crops for the Buffalo market. Little stock is kept in this region, only two farms having more than six cows. Eleven farms are located in southern New York. Dairying is here the principal enterprise and few crops are grown for sale. Two of the farms in this region raise some truck crops for local markets, and two farms grow some tobacco. Twelve farms are located in the general farming region of central New York. Dairying is an important enterprise on these farms, but considerable quantities of various crops are grown for sale. Four farms are located in southeastern New York. Three of these are intensive dairy farms, while the fourth, in the Hudson Valley, produces fruit and truck crops for local markets.

## METHODS OF INVESTIGATION

In mapping these farms, many different methods were tried in an effort to combine a reasonable degree of accuracy with speed. The first farms were mapped with only a 100-foot steel tape, all lines and any necessary angles being measured. Where farms are rectangular in outline, with rectangular fields, this method is the most rapid and satisfactory. Where farm or fence lines are crooked it is impracticable, and, since most New York farms are at least partly irregular, some means must be found to map these irregular lines. Hand compasses and general-purpose levels were tried and discarded. The method that was found most satisfactory was to use a steel tape for measuring the boundaries and all straight lines in a farm, and a surveyor's transit for mapping the irregular parts. On most farms it was necessary to run only a short traverse with a transit, locating the corners of all irregular lines accessible from each station by the horizontal angle and the distance to each. All distances were read by stadia. When targets are used, this method is both rapid and accurate. In all cases the present farm fences were mapped, and no effort was made to run out the deed lines. Deed descriptions were obtained in some cases for checking purposes, but in many deeds the descriptions were inaccurate.

In addition to the measurements of the different parts of the farms, other data were obtained in the mapping. Every change in the kind of fence was recorded in the field notes, and from this record the kinds of fence, and the number of rods of each kind on every farm, were found. The width of the strip of land occupied by each kind of fence, with different crops, was measured. Where the width of the strip varied along the edge of a field, the average width was estimated and checked by frequent measurements. The area of the land in crop fields occupied by swampy spots, streams, open ditches, driveways, trees, stone outcrops, stone piles, and barns was measured, as well as the crop land untillable because rough, or wasted because of proximity to woods. All important buildings and the divisions of the farmstead were measured and located. Where possible, the history of the fields and the farm was learned from the owner. Data were obtained on the character of the pasture land. Woodlots were located, and notes were taken on the suitability of the land for other purposes. Orchards were classified by kinds, and as to whether or not they were bearing. In short, an effort was made to get as complete information as possible concerning the utilization of all the land on these farms.

The farm maps were drawn to a uniform scale of 200 feet to the inch. Except for very large and very small farms, these proportions are satisfactory. In addition to farm and field lines, the kinds of fence and all the physical features of the farm were shown on the maps. This necessitated the provisions of a set of symbols which could be drawn rapidly. Some ideas for these symbols were obtained from the conventional signs adopted as recommended practice by the American Society of Agricultural Engineers. The symbols used are shown in figure 68.

Areas of fields and other farm divisions were obtained from the maps by the use of a planimeter. After ascertaining an area in square inches by averaging four or five observations of the planimeter, this area was reduced to square feet and then to acres. The area of each crop field was designated by two figures, the top figure representing the gross area included within the boundaries of the field, and the lower figure the area actually in crops, after deducting the land occupied by fences, stone piles, streams, and other obstructions.

The accuracy of the maps and of the areas of the different divisions in all cases was checked by observation by the farmers. The areas of

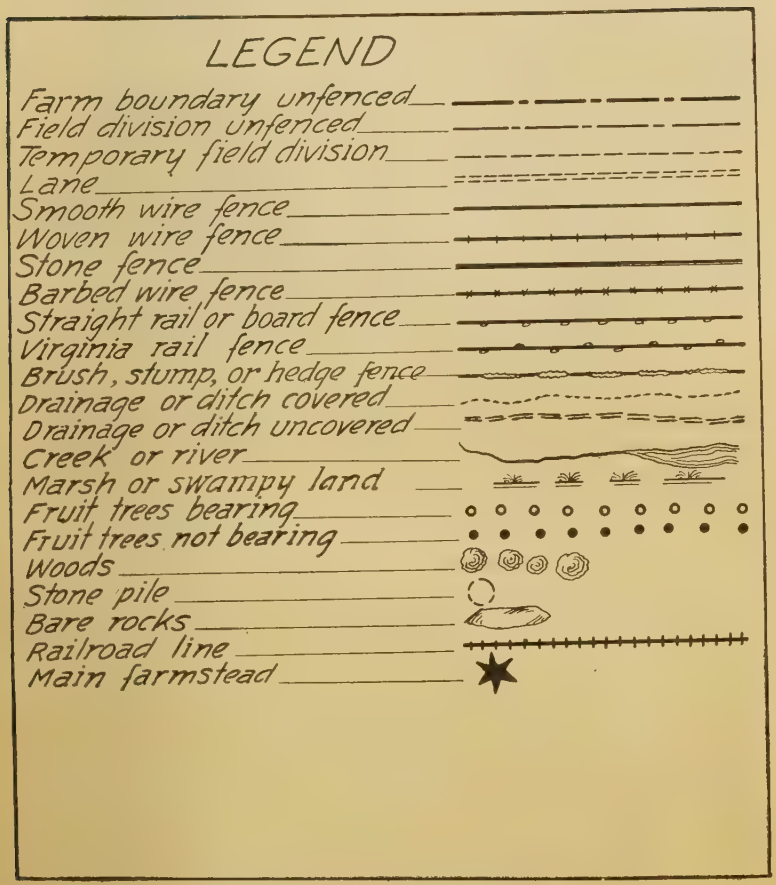


Fig. 68. SYMBOLS USED IN MAPPING FARMS

fields were roughly checked by comparison with farmers' estimates previously made. The areas of the farms were also checked by comparison with the acreages as given in the deeds. The best check on the accuracy of the methods employed was obtained by comparing the total area of

the farm, as computed from the measured dimensions, with the sum of the areas of the different farm fields taken from the map by the use of the planimeter. This method of checking gave the combined error in drawing the maps to scale and in figuring the acreages. For fourteen rectangular farms that were thus checked, the average variation of the sum of the areas of the farm fields from the computed area of the farm was one-fifth of one per cent, the maximum variation being less than one-half of one per cent. Some farms nearly rectangular in shape were checked by completing the rectangle, adding the additional area to the farm area, and comparing this total with the area of the rectangle as computed from the dimensions. This method, however, checks only the accuracy of the planimeter areas.

In most cases the present farm areas, as thus determined, overran the deed acreages. Of thirty-eight farms for which the deeds and the measured areas were compared, thirty-one overran the deed acreage, the average overrun being 3.5 per cent. The average variation of all these thirty-eight farms was 3.1 per cent from the deed acreage.

In these studies a field is considered to be all the land usually farmed as a unit. In comparing layouts of different farms in the following pages, the average size of the farmed fields and the average distance to these fields are usually given. In computing the average size of the fields for each farm, the area in field crops was divided by the number of fields usually farmed. In computing the average distance to fields, the usual line of travel to the fields was measured. Both the distance to the nearest gates and the distance to the centers of crop fields were measured, but, since with most farm operations unproductive travel ends at the gate, the former figure is used herein unless otherwise indicated. In all cases the average distance to fields for each farm is the weighted average distance.

The total estimated acreage of 380 farm fields, as given by farmers, varied from their measured acreage by less than two-fifths of one per cent. Farmers ordinarily estimate areas in acres and fractions of an acre, seldom trying to estimate closer than a half acre, while the measured areas were computed to the nearest one-hundredth of an acre. For this reason the percentage variation of estimated from measured areas of single fields was high with small fields. With fields of less than two acres, the average variation of individual estimates from measured areas was about nineteen per cent. The average variation of the estimates decreased with larger fields up to 20 acres. With fields from 12.1 to 20 acres in size, the average

variation of individual estimates from measured areas was about seven per cent. With all sizes of fields the number of over-estimates was approximately equal to the number of under-estimates, and, as in other cases where judgment is unbiased, the errors were compensating.

## HOW FARM LAYOUTS HAVE DEVELOPED

Practically all of the land in New York farms was originally covered with forests. A large part of this land was more or less stony. These factors made the task of clearing the land for cultivation a long and laborious one, and their effect can be plainly seen on the layout of farms today.

The first task of the settler was to provide a shelter for himself and his family. In deciding on a location for his farmstead, little or no attention was paid to its convenience as a center for farm operations. The most important considerations were that the buildings should be near a supply of good water, preferably a spring, and that they should be accessible to the roads then in use.

After shelter had been provided, the next task of the settler was to clear the land for cultivation. The drier, warmer parts of the farm were usually cleared first. The shape of these clearings, and the directions of their boundaries, were often matters of chance. After cutting and burning the trees and brush until a patch of sufficient size had been cleared, the settler removed the surplus surface stones, piling or throwing them around the edge of the clearing. Crops could then be grown between the tree stumps until the roots rotted so that they could be pulled. Other patches were successively cleared in the same haphazard fashion, and fences of rails, stumps, or stones, or of combinations of these materials, were built between them. Small, irregular fields were the natural result of clearing land under these conditions. In some cases the fences were made parallel with the farm boundaries, but oftener they were not. These small, irregular fields were not a serious drawback to cultivation with the hand-labor methods then existing. Mowing was done with a scythe, and reaping with a cradle. Grain was sown broadcast by hand and most of the cultivating was done with a hoe. A two-acre field was probably as large in terms of human labor as a ten-acre field is to-day. Neither were these small, irregular fields difficult to fence. With rail, stump, or stone fences, the irregularity of the fields made little difference.

Another factor that has influenced the development of farm layouts is the size of grants of land made to the early settlers. Examination of the original deeds of many New York farms has shown that much of the farm land of New York was sold or given to settlers in small tracts of from 50 to 100 acres. The general plan followed in making grants to settlers was to give each settler enough land to maintain a family. The few large grants made in very early times to Dutch patroons in eastern New York were cut up into family farms owned by the men who tilled them. The ideal was the family farm, and consequently most of the farm land available for settlement was divided into tracts of a size deemed sufficient for maintaining a family. The amount of land necessary for this purpose varies widely according to the natural productivity of the soil, but, since little was known of the relative productivity of the soil in different regions, little allowance appears to have been made for this factor in laying out farms for settlement. A large farm could not be cleared and worked by a single family with hand-labor methods. Furthermore, in these newly settled regions the settler's family did not have to rely entirely on the productivity of the soil for their living. Lumbering offered an opportunity of earning money during the winter months, and thus helped to maintain the family while the land was being cleared for farming.

In laying out farms for settlement, little attention was paid to making them of such shape as to be conveniently worked. In eastern New York the original farms were often irregular in outline. In central and western New York most of the farms were rectangular in shape, but the 50-acre farms were made in some counties about 50 by 160 rods, in other counties 33 by 240 rods. With such long, narrow farms, a large part of the land is remote from the buildings and much labor is wasted in travel.

After most of New York was settled, important changes took place in farming practice, due principally to the use of labor-saving machinery. The invention and use of the mower, the reaper, the drill, and other labor-saving tools greatly increased the effectiveness of human labor and consequently the area of land that could be farmed by one person. The small, irregular fields which had resulted partly from the accidents of clearing and partly from topography, were a serious handicap to the use of machinery. Stones, stone piles, and other obstructions added to the difficulty of working these small, irregular fields with machinery. Steep slopes which had been mowed easily with a scythe or a cradle could not

be cut with a mower or a reaper. The opening-up of the Middle West about this time made available large areas of level fertile soil, and farm land not adapted to machine cultivation could not compete successfully in crop production with these favored regions. Some entire farms were abandoned. On many farms, fields not adapted to machine production were changed to pasture land.

Since the use of labor-saving machinery enabled them to work larger areas than the original small farms, farmers began to combine two or more of these small farms into larger farm units. The extension of the use of machinery has continued down to the present day, and an increase in the size of farms has followed as a natural result. The numbers of farms of different sizes as reported in the federal censuses since 1860 are shown in table 1:

TABLE 1. Changes in Size of Farms in New York State as Shown by United States Census Reports from 1860 to 1910

| Size of farms (acres) | Number of farms | | | | | |
|---|---|---|---|---|---|---|
| | 1910 | 1900 | 1890 | 1880 | 1870 | 1860 |
| Under 10 | 18,655 | 16,760 | 13,166 | 14,913 | 13,078 | 6,763 |
| 10–99 | 103,401 | 114,694 | 120,569 | 128,276 | 146,982 | 139,849 |
| 100–499 | 92,194 | 93,909 | 91,323 | 96,273 | 55,948 | 50,132 |
| 500 or over | 1,347 | 1,357 | 1,165 | 1,596 | 245 | 246 |
| Total number of farms | 215,597 | 226,720 | 226,223 | 241,058 | 216,253 | 196,990 |
| Average size of farms (acres) | 102 | 100 | 97 | 99 | 97 | 106 |

Apparently the average size of New York farms as reported by the census has not been increasing. The number of so-called "farms" of less than 10 acres has increased greatly since 1860; the number of farms of from 10 to 99 acres has decreased; while the number of farms of 100 acres or more has increased. The increase in the numbers of small "farms" has tended to offset the effect of the increased number of moderately large farms, and as a result there has been little change in the average size of the "census" farm. Very many of the places of less than 10 acres are not real farms on which the operators make their living, but

are homes for persons engaged in industry. There is no doubt that the average size of the general farms in New York has increased considerably during this period.

As a result of these changes, many present-day farms are compounds or complexes of original smaller farms or parts of farms. The fifty-three typical farms included in this study were composed of at least one hundred and twenty-six smaller farms or parts of farms, to the knowledge of their present owners. The number of farms composed of one, two, three, four, or more parts is shown in table 2:

TABLE 2. Composition of Present-Day Farms

| Size of farms (acres) | Total number of farms | Number of farms made up of | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | One part only | Two parts | Three parts | Four parts | Five parts | Fifteen parts | Twenty-two parts |
| Less than 100 | 13 | 8 | 2 | 2 | 1 | 0 | 0 | 0 |
| 100–174.9 | 20 | 11 | 5 | 2 | 0 | 1 | 0 | 1 |
| 175 or over | 20 | 3 | 6 | 4 | 5 | 1 | 1 | 0 |
| All farms | 53 | 22 | 13 | 8 | 6 | 2 | 1 | 1 |

Three-fifths of the fifty-three farms were made up of two or more original farms or parts of farms. One large farm of 478 acres was made up of fifteen distinct farms or parts of farms ranging in size from 10 to 120 acres. Another farm of 150 acres was made up of twenty-two parts.

The process by which the small original farms have been combined into larger farm units can best be illustrated by maps showing different stages in the development of typical farms. The outlines of five farms in central New York as they appeared when settled between 1800 and 1835 are shown by figure 69. Farms A, B, and C were distinct, complete 50-acre farms settled by different men; D was a tract of 50 acres forming a part of a larger farm; and E was a 12-acre lot which was a part of a fifth farm. Log houses and barns were built on farms A, B, and C on the locations shown. The north ends of these farms were cleared first. About 1845 the main road was put thru south of B, C, and D, and at about the same time farm C was sold by its first owner. The new owner of

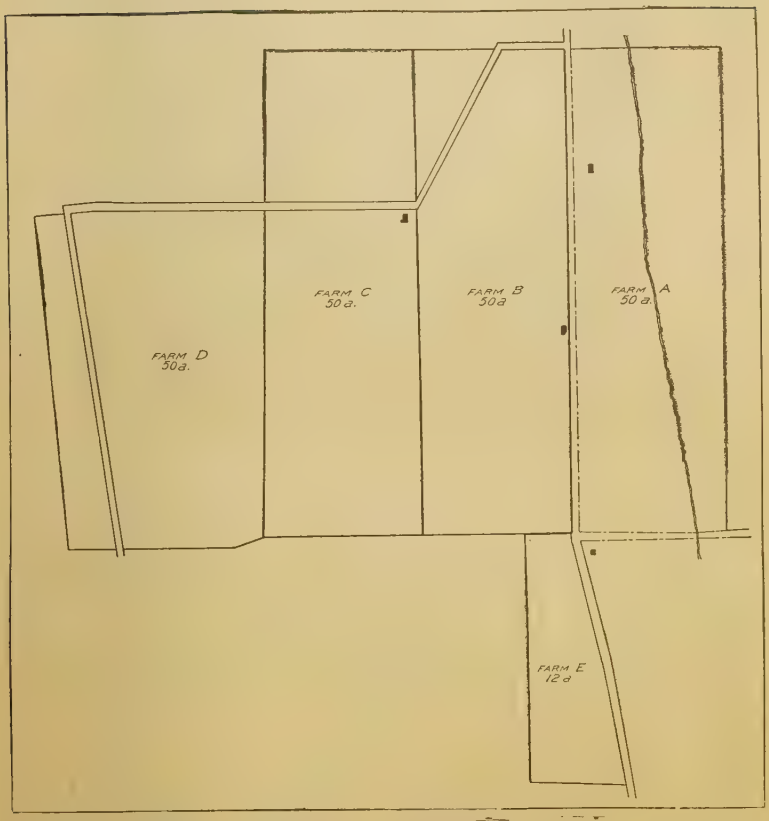


Fig. 69. DEVELOPMENT OF A CENTRAL NEW YORK FARM — Original plan, showing outlines of farms A, B, C, D, and E when settled

farm C never lived in the original log house at the north end of the farm, but changed the location of the farmstead to the extreme southeastern corner of this farm on the new road. He moved the original barn to the new farmstead and built a new house, living for a time during the summer in the old barn while the house was under construction. After clearing the south end of farm C, this man began the present consolidation by buying 25 acres of D, on the west of his farm. After clearing this he bought the remaining 25 acres of D. About this time the road running north thru farm D was moved west to its present location as the western boundary of this farm, in order to avoid a steep hill, and the road running across the north ends of farms B and C was abandoned.

The owner of farm CD died and the land was inherited by a son who continued the process of combination begun by his father. He first bought farm B, on the east of the farm inherited. This made him the owner of three of the original 50-acre farms, B, C, and D. The 12-acre lot E also came under his management thru inheritance by his wife. After cutting the remainder of the timber from farm B, the owner of farms B, C, D, and E took advantage of a good opportunity and sold this farm.

The location of the farmstead of farm C was in the southeastern corner of the farm, adjoining one of the crop fields of farm B. Because of this proximity, poultry from the farmstead of farm C did more or less damage to the crops in the adjoining field and caused some ill feeling between the neighbors. Partly to avoid this difficulty, and partly because it was a better field, the owner of farms B, C, D, and E retained this 10-acre field in selling farm B, and sold instead a larger field from the north end of farm C. The outline of the farms at this stage of their development is shown by figure 70.

In 1899 farms C, D, and E were purchased by the present owner. Two years later this farmer bought farm A, which had been an independent unit up to this time. In 1918 he bought farm B, thus bringing under one management land which was in five different farms eighty years earlier. The last two stages in the development of this farm are shown in figures 71 and 72. The area of the combined farms is 216 acres, a moderately large family farm. Probably it is no larger in terms of human labor than a similar farm of half the area eighty years ago.

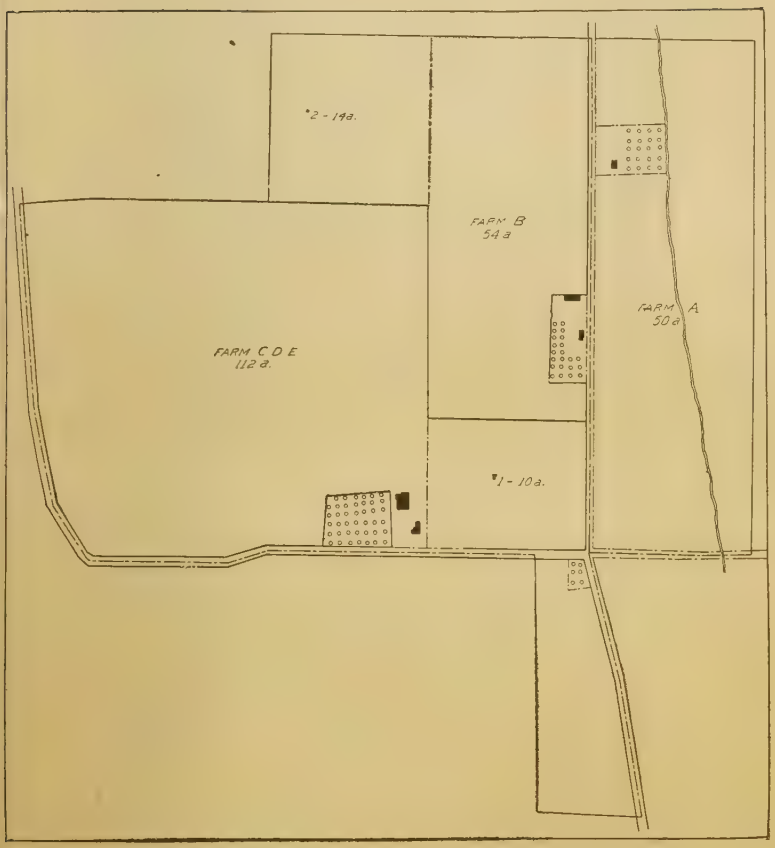


FIG. 70. DEVELOPMENT OF A CENTRAL NEW YORK FARM — II

The original farms C, D, and E have been combined, but A and B are separate farm units

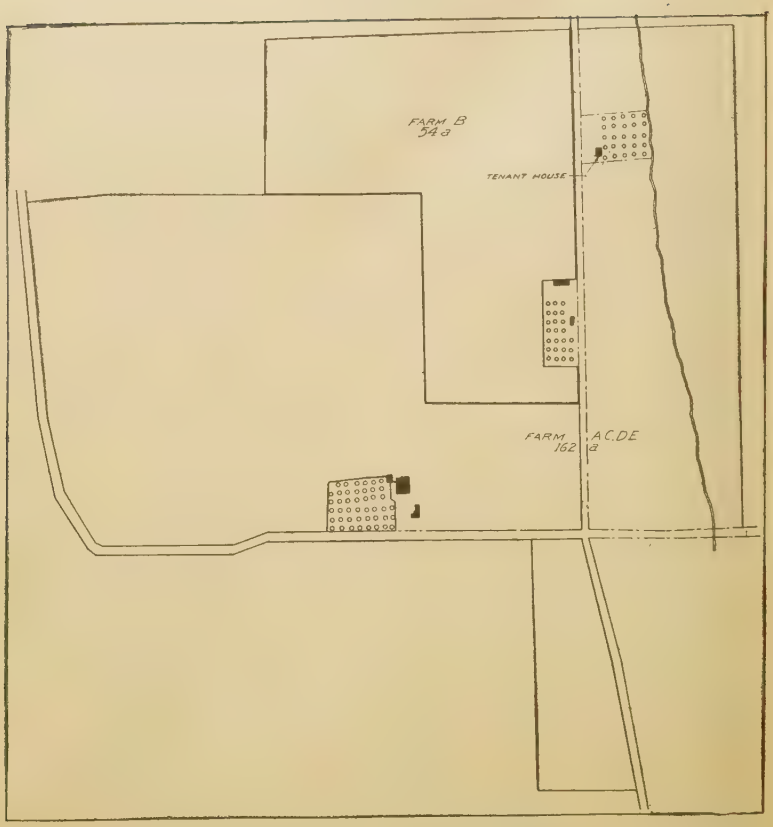


FIG. 71. DEVELOPMENT OF A CENTRAL NEW YORK FARM — III

In 1899 farm CDE was purchased by the present owner and two years later farm A was added, making the combined farm area 162 acres

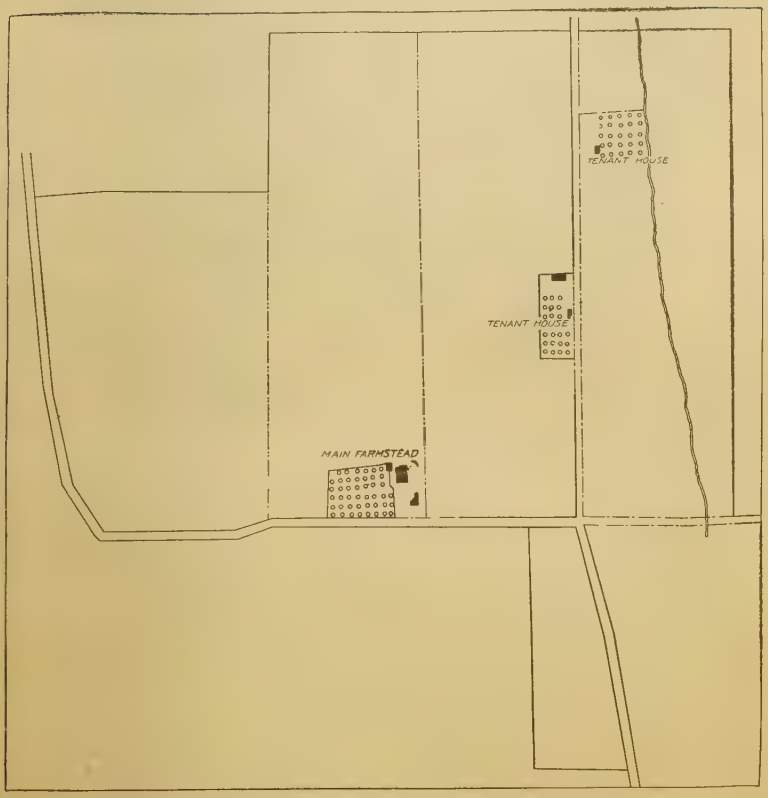


Fig. 72. DEVELOPMENT OF A CENTRAL NEW YORK FARM — IV
In 1918 farm B was purchased, thus bringing the five small original farms into one farm of 216 acres

This is not an isolated case. A similar process has been going on in all parts of the State as the development of farm machinery has increased the effectiveness of human labor and consequently the area of land that can be farmed to best advantage by one family. Other forces, however, are pulling against this tendency to increase the size of farms. Every farm changes hands at least once in a generation. Tenants and other persons of small means often wish to buy small farms at first, because of lack of capital, with the expectation of buying more land later if successful. There is also a constant tendency to divide farms among the heirs when

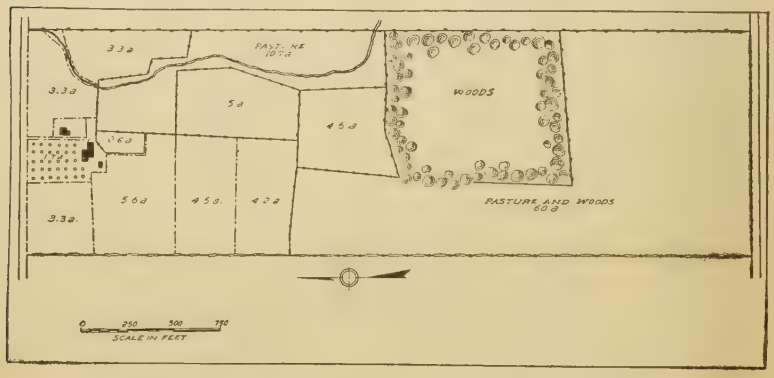


Fig. 73. PLAN OF A WESTERN NEW YORK FARM IN 1906

The area of the farm at this time was 110 acres, 35 acres having already been added to the original 75-acre farm

farms change hands by inheritance. The result of these conflicting forces is a slow increase in the average size of farms.

The plan of a western New York farm in 1906 is shown in figure 73. The area of the farm was then about 110 acres, 35 acres having been added to the original farm of 75 acres before that time. In this vicinity much of the land was surveyed into rectangular farms of from 50 to 100 acres, three-quarters of a mile long. Such long, narrow farms were never adapted to economical operation. Land at the end of one farm, three-quarters of a mile from the buildings and too remote for economical operation, is usually directly across the road from the farmstead of another

farm which in turn has fields three-quarters of a mile away. This mistake in laying out farms has cost New York farmers many thousands of dollars in lost time traveling to and from remote fields.

In 1907 an adjoining farm of 65 acres was added to the farm just mentioned. The plan of this larger farm of 175 acres is shown in figure 74. No further change was made in the size of this farm until 1917, when the 100-acre farm across the road was rented and added to the 175 acres

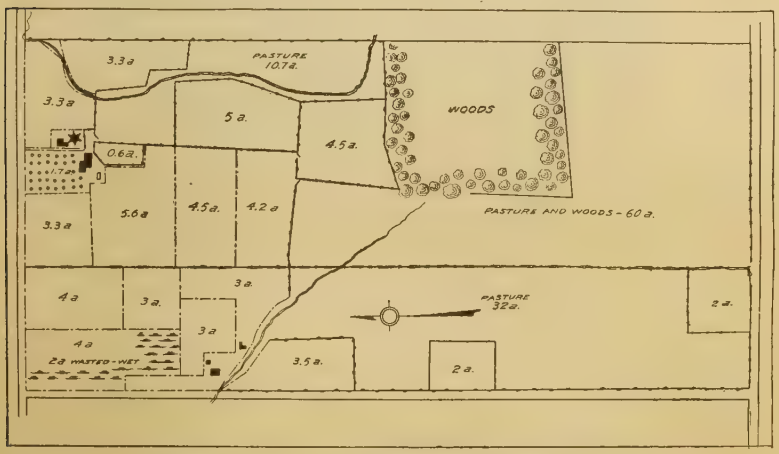


FIG. 74. PLAN OF THE SAME FARM IN 1907

The area of the farm at this time was 175.8 acres, the adjoining farm of 65 acres having been acquired by purchase

already owned. The plan of the combined farms is shown in figure 75. It is probable that the smaller farm will be purchased within a few years and made a permanent part of the larger farm, since it would be more valuable as a part of this farm than as an independent unit. In this region a farm of 100 acres is too small for economic operation, because a large part of the land is so rough or so wet as to be adapted only for pasture. The area of crop land in this 100-acre farm, 37 acres, is too small to allow of efficient use of labor and machinery with general farm crops when farmed independently, and the land is not adapted to intensive

FIG. 75. PLAN OF THE SAME FARM IN 1918

In 1917 the unprofitable 100-acre farm across the road was added by rental, making the present farm area 275 acres

cropping. In this case the small farm makes a valuable adjunct to the larger farm. The pasture is needed in pasturing the large herd of cows kept on the larger farm. The barn is convenient for keeping young stock thru the winter, and the house is well located for the home of a hired man. The crop land is convenient to the farmstead of the larger farm. The present farm of 275 acres is not too large for a family farm in this region. It is smaller in terms of human labor than the 216-acre farm whose history is given in the preceding pages.

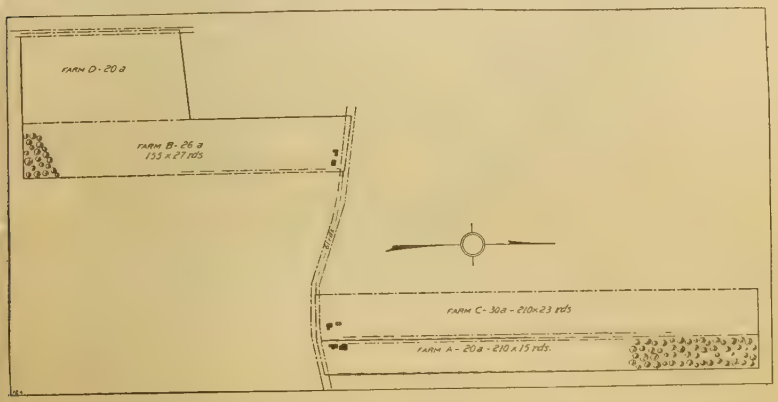


Fig. 76. Plan of a western New York fruit farm in 1917 showing the original farms that have been combined into one farm business

The very long, narrow farms found in this region are inconvenient to work and result in much wasted labor

In this process of combining farms to keep pace with changing conditions, it has not always been possible to procure land adjacent to the farm already owned. The plans of four farms in western New York which have been combined into one farm business are shown in figure 76. In this region the farm land was first surveyed into areas of 160 acres, and these were later cut up into small farms of from 20 to 50 acres. Because of the value of frontage on the main highway along which these farms are located, the small farms were made very long and narrow. Farm A was an extreme example of this arrangement, being more than 200 rods long and only 15 rods wide. Such a layout is economical of

road frontage but extremely wasteful of labor, land, and fencing. The long distance which must be traveled to the remote fields of even a 20-acre farm is readily apparent. Furthermore, with the type of fence used on many of these farms this arrangement is very wasteful of land. The present owner of these farms bought the two farms A and B in 1888. At this time large osage-orange hedges formed the eastern boundary of farm A, and also the line between farms A and C. These hedges wasted more than a rod of land on each side. In addition a driveway was necessary to give access to the back fields. The two hedgerows and the driveway made untillable about one-sixth of the area of farm A as far back as they extended. In 1904 farm C was added to farms A and B, making the farm area 76 acres. Having control of farms A and C, this farmer pulled out the hedge between them, thereby gaining about an acre and a quarter of land as well as eliminating one driveway. In 1916 farm D, of 20 acres, was added, bringing the farm up to the size here shown. Further additions have since been made.

This farm is located in one of the most prosperous agricultural regions of the State. The land is largely devoted to fruit and other intensive crops. The accessibility of the fields from the farmstead is far more important under these conditions than where only extensive crops are grown. Altho much smaller in area, this farm is larger in terms of human labor than the 275-acre farm discussed just previously.

A farm representing an extreme case, in which twenty-two parcels of land have been combined to form one farm of 150 acres, is shown in figure 77. Some of these parcels were town lots of the decadent village in which the farm is located. The scattered, patchwork appearance of this farm shows the difficulties that have been encountered in trying to procure enough land to make a farm of reasonable size.

The foregoing examples are intended to give typical illustrations of the combination of farms in response to changing methods of production. Not all farms are composed of as many parts as the examples given. These farms are larger today than the average farm, and hence they would be expected to be made up of more parts.

As larger and more improved machines come into use, the problem of rearranging farms to permit the economical use of machinery becomes more important. Every new, improved farm machine is a new argument for a better farm layout. The newest farm machine, the tractor, is no

exception to this rule. One of the striking facts brought out by an investigation of tractors in Illinois[1] is that a third of the tractor owners increased the size of their farms after purchasing tractors. In so far as tractors come to be used in this State, it may be expected that they will tend to continue the

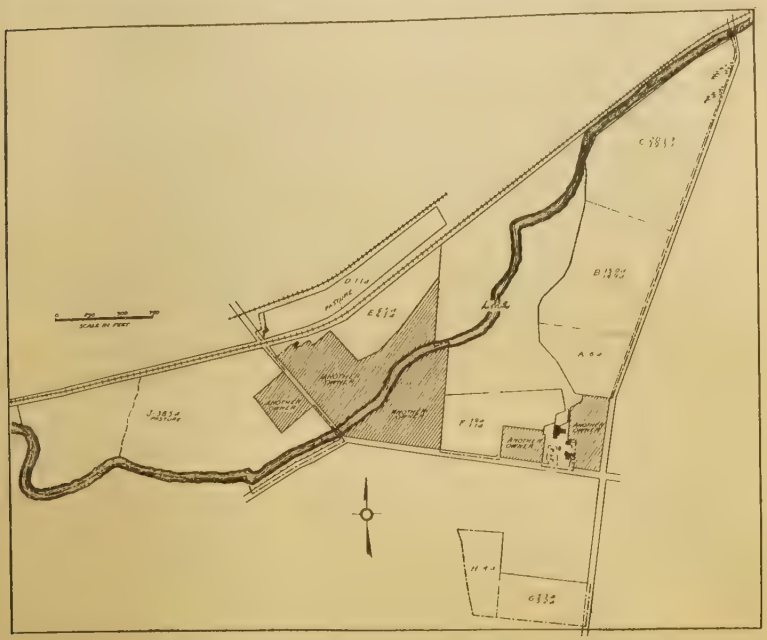

FIG. 77. PLAN OF A SOUTHERN NEW YORK FARM

This farm represents an extreme case in which twenty-two parcels of land have been combined to form one farm of 154.3 acres. The scattered, patchwork appearance of this farm shows the difficulties that have been encountered in trying to acquire enough land to make a farm of reasonable size

process of combination of farms begun when the first labor-saving machine came into use, nearly a century ago. It may also reasonably be expected that the tractor will give greater impetus to the rearrangement of farms, because large fields are necessary for economical operation.

[1] Tractor experience in Illinois, page 7. By Arnold P. Yerkes and L. M. Church. U. S. Dept. Agr. Farmers' bul. 963. 1918.

The response to the conditions that have made desirable some rearrangement of farms has been varied. A few persons have rearranged farms too rapidly, giving undue importance to this phase of farm management and often incurring greater expense in making the rearrangement than is justified by the saving to be made. To this class of persons would belong many rich men, some over-enthusiastic students, and a few farmers. On the other hand, most farmers have not made these readjustments as rapidly as would probably be justified. Agricultural conditions for the decade preceding 1915 justified a more rapid rearrangement of farm layouts than any other period since the Civil War, and these conditions may reasonably be expected to continue.

The layout of a farm is far from being the most important factor for success in farm management. For this reason the improvements of farm layout should always be subsidiary to the main business of farming, which is the producing of food. Plans for a satisfactory rearrangement require much thought and time. Both the changes to be made and the order in which they are to be made should be determined in advance. Any one planning to rearrange a farm should be very sure of his plans and then should proceed slowly.

## FARM LAYOUT

### SIZE OF FIELDS

The most important factor in the layout of farms is the size of the farmed fields. Size of fields affects not only the efficiency of labor, but also the economy of fencing and of land.

#### *Effect of size of fields on labor*

The most important effect of size of fields is on the labor required for the different field operations. For economy of labor, fields should be large. The importance of size of fields as affecting labor depends on the number of horses driven, and on the operation to be performed. The negro with one mule can farm small fields, but when three- to six-horse teams are used, fields should be large. With tractors it is even more important that fields should be large. It is more important to have large fields for plowing than for mowing. Large fields are not usually mowed all at once, but in two or more parts.

In order to determine the effect of size of fields on the labor required for various farm operations, a study was made of the labor records, for the years

1914 to 1917, of the farms on which cost accounts have been kept by the owners in cooperation with the New York State College of Agriculture and the Office of Farm Management of the United States Department of Agriculture. In these cost accounts an account is kept with each crop rather than with each field. On many farms two or more fields of the same crop are produced and the labor records for the different fields are not kept separate. For this study, only those records were included in which only one field of a given crop was grown, or in which the records of the different fields had been kept separate. In all cases the data are actual time records kept by farmers. The effect of size of fields on the labor required for various farm operations is shown by tables 3 to 8. In considering the results of these tables it should be borne in mind that the larger fields are

TABLE 3. Relation of Size of Fields to Labor Required to Plow an Acre

| Size of fields (acres) | Number of fields | Average size of fields (acres) | Average length of fields (rods) | Time required to plow one acre | |
|---|---|---|---|---|---|
| | | | | Man hours | Horse hours |
| Less than 2 | 40 | 1.02 | 20.6 | 8.5 | 19.8 |
| 2–4.9 | 57 | 3.48 | 34.6 | 6.5 | 15.0 |
| 5–9.9 | 78 | 7.24 | 49.9 | 6.2 | 16.2 |
| 10–14.9 | 40 | 11.68 | 54.7 | 5.7 | 14.3 |
| 15 or more | 27 | 20.26 | 77.9 | 5.1 | 13.2 |
| Total | 242 | ..... | ..... | ..... | ..... |
| Average | ..... | 7.51 | 45.4 | 5.8 | 14.8 |

usually found in regions of more level topography. Large fields are usually found also on the larger farms. Since both of these correlated factors have an effect on the labor required for various farm operations, it is probable that the results due to size of fields alone are less than the figures indicate.

Apparently the saving of labor in plowing effected with larger fields, as shown in table 3, is not due to the use of more horses per team, since there is little variation in the average number of horses per man between the smallest and the largest fields. One of the reasons for the saving of labor with large fields is the time lost in turning in small fields. If the fields

were plowed with a 14-inch plow, 110 turns to the acre would be required in plowing fields of 1 acre, but only 29 turns to the acre would be required in the 27-acre fields. The necessary time required to turn a three-horse team and the plow, and get ready to start back, was found to average about a half minute. In addition to the time necessarily lost in turning, there is a tendency to rest oftener when turns are frequent.

TABLE 4. RELATION OF SIZE OF FIELDS TO LABOR REQUIRED TO ROLL AN ACRE

| Size of fields (acres) | Number of fields | Average size of fields (acres) | Average length of fields (rods) | Time required to roll one acre | |
|---|---|---|---|---|---|
| | | | | Man hours | Horse hours |
| Less than 3 | 9 | 1.58 | 22.6 | 1.18 | 2.36 |
| 3–4.9 | 15 | 3.91 | 41.2 | 0.95 | 1.90 |
| 5–9.9 | 29 | 7.47 | 49.8 | 0.68 | 1.36 |
| 10–14.9 | 11 | 11.69 | 48.5 | 0.77 | 1.54 |
| 15 or more | 12 | 20.97 | 85.9 | 0.65 | 1.30 |
| Total | 76 | ..... | ..... | ..... | ..... |
| Average | ..... | 8.81 | 50.4 | 0.72 | 1.44 |

The saving of time in rolling large fields (table 4) is proportionately as great as that in plowing large fields, but, since rolling is a rapid operation, the total hours saved per acre are less in rolling than in plowing.

TABLE 5. RELATION OF SIZE OF FIELDS TO LABOR REQUIRED TO DRILL AN ACRE

| Size of fields (acres) | Number of fields | Average size of fields (acres) | Average length of fields (rods) | Time required to drill one acre | |
|---|---|---|---|---|---|
| | | | | Man hours | Horse hours |
| Less than 2 | 9 | 1.07 | 20.4 | 1.93 | 3.86 |
| 2–4.9 | 29 | 3.47 | 36.7 | 1.36 | 2.72 |
| 5–9.9 | 45 | 7.29 | 51.3 | 1.10 | 2.20 |
| 10–14.9 | 21 | 11.75 | 53.7 | 1.04 | 2.08 |
| 15 or more | 16 | 21.91 | 82.2 | 1.01 | 2.02 |
| Total | 120 | ..... | ..... | ..... | ..... |
| Average | ..... | 8.63 | 50.0 | 1.09 | 2.18 |

TABLE 6. RELATION OF SIZE OF FIELDS TO LABOR REQUIRED TO MOW AN ACRE

| Size of fields (acres) | Number of fields | Average size of fields (acres) | Average length of fields (rods) | Time required to mow one acre | |
|---|---|---|---|---|---|
| | | | | Man hours | Horse hours |
| Less than 2 | 11 | 1.54 | 28.5 | 1.3 | 2.6 |
| 2–4.9 | 21 | 3.35 | 37.6 | 1.2 | 2.4 |
| 5–9.9 | 11 | 7.08 | 46.2 | 1.0 | 2.0 |
| 10 or more | 7 | 15.73 | 61.4 | 1.0 | 2.0 |
| Total | 50 | ..... | ..... | ..... | ..... |
| Average | ..... | 5.50 | 40.8 | 1.1 | 2.2 |

Size of fields is less important in mowing (table 6) than in most other farm operations. One reason for this difference is that large fields usually are not mowed as one field but are mowed in two or more parts.

TABLE 7. RELATION OF SIZE OF FIELDS TO LABOR REQUIRED TO CUT AND BIND AN ACRE OF CORN WITH A CORN HARVESTER

| Size of fields (acres) | Number of fields | Average size of fields (acres) | Average length of fields (rods) | Time required to bind one acre of corn | |
|---|---|---|---|---|---|
| | | | | Man hours | Horse hours |
| Less than 5 | 7 | 3.63 | 43.4 | 2.3 | 6.6 |
| 5–9.9 | 9 | 7.12 | 48.7 | 2.1 | 5.4 |
| 10 or more | 6 | 14.40 | 70.1 | 1.8 | 5.5 |
| Total | 22 | ..... | ..... | ..... | ..... |
| Average | ..... | 8.0 | 52.9 | 2.0 | 5.6 |

The cost-account data on which these studies were based could not be used for studying the effect of this factor on dragging and cultivating. However, there is every reason to suppose that, in these operations as in the others, larger fields give more effective use of labor. The saving of labor by large fields in any one operation may not be important, but the aggregate saving in several operations is worthy of careful consideration.

TABLE 8. RELATION OF SIZE OF FIELDS TO LABOR REQUIRED TO CUT AND BIND AN ACRE OF GRAIN WITH A GRAIN HARVESTER

| Size of fields (acres) | Number of fields | Average size of fields (acres) | Average length of fields (rods) | Time required to bind one acre of grain | |
|---|---|---|---|---|---|
| | | | | Man hours | Horse hours |
| Less than 2 | 10 | 1.17 | 22.2 | 2.22 | 5.77 |
| 2–4.9 | 30 | 3.54 | 37.2 | 1.61 | 4.22 |
| 5–9.9 | 34 | 7.09 | 45.7 | 1.33 | 3.81 |
| 10–14.9 | 15 | 11.69 | 49.7 | 1.38 | 3.74 |
| 15 or more | 18 | 20.47 | 77.8 | 1.23 | 3.66 |
| Total | 107 | ..... | ..... | ..... | ..... |
| Average | ..... | 8.44 | 47.1 | 1.34 | 3.87 |

*Effect of size of fields on economy of fencing and of land*

Fences around crop fields make more or less land untillable. With fields of a constant shape, the larger the field, the fewer rods of fence to the acre are required to inclose it. Therefore, with larger fields a smaller proportion of the area is occupied by fences. If a square field of 1 acre is fenced, about 50 rods of fence are required to inclose it; if a square field of 10 acres is fenced, only 16 rods of fence to the acre are required to inclose it; while only 8 rods of fence to the acre are required to inclose a square field of 40 acres. If the width of the land occupied by fences in the three fields were uniform, the amount of waste land to the acre would be twice as much in the 10-acre field as in the 40-acre field, and more than six times as much in the 1-acre field as in the 40-acre field.

A study was made of the relation of size of fields to economy of fencing and of land for the fenced crop-fields on the fifty-three New York farms. All fields of a given size are included, regardless of shape. The results are shown in table 9. In these results, the number of rods of fence to the acre includes all of the fence around each field. When a fence serves for two fields, the amount of fence necessary for each would be correspondingly reduced.

The importance of the effect of size of fields on land occupied by fences and on the amount of fencing depends on the value of the land, on the amount of crop land fenced, and on the cost of fence maintenance. If

the farm were divided into 2-acre fenced fields, about 4.5 per cent of the crop land would be occupied by fences; or, in other words, of every 100 acres of crop land, only 95.5 acres would be available for producing crops.

TABLE 9. Relation of Size of Fields to Economy of Fencing and of Land in Crop Fields Completely Fenced

| Size of fields (acres) | Number of fields | Average size of fields (acres) | Rods of fence to the acre | Per cent of crop land occupied by fences |
|---|---|---|---|---|
| Less than 4 | 26 | 2.15 | 36.7 | 4.64 |
| 4–7.9 | 41 | 6.30 | 21.1 | 3.75 |
| 8–11.9 | 64 | 9.84 | 16.7 | 2.66 |
| 12–15.9 | 27 | 13.28 | 15.1 | 2.26 |
| 16–23.9 | 24 | 18.44 | 12.7 | 1.85 |
| 24 or more | 12 | 38.33 | 9.0 | 1.12 |
| Total | 194 | ..... | ..... | ..... |
| Average | ..... | 11.37 | 15.1 | 2.29 |

*Conclusions on effect of size of fields*

The preceding studies show that large crop fields give greater economy of labor than do small fields. The effect of size of fields on labor, on any farm, depends on the number of horses driven to a team and on the crops grown, but it is important on every farm. The effect of size of fields on the economy of fencing and of land depends on the proportion of the crop area fenced, on the value of the land, and on the cost of fence maintenance, but it is important on most farms. For these reasons farmed fields should be as large as conditions will permit.

The size of the farm, the type of farming, and the length of the rotation or rotations followed, limit the size of fields on any farm. With the practice of more or less definite crop rotations, it is desirable to have as many fields as there are years in the rotation, and to have the fields of approximately equal size. With 100 acres of land available for general crops and a five-years rotation, the most desirable size of field would be 20 acres. This would give five 20-acre fields. On some farms, two distinct rotations are followed — a short rotation of more intensive crops on fields near the buildings, and a longer rotation of more extensive crops on the remoter fields.

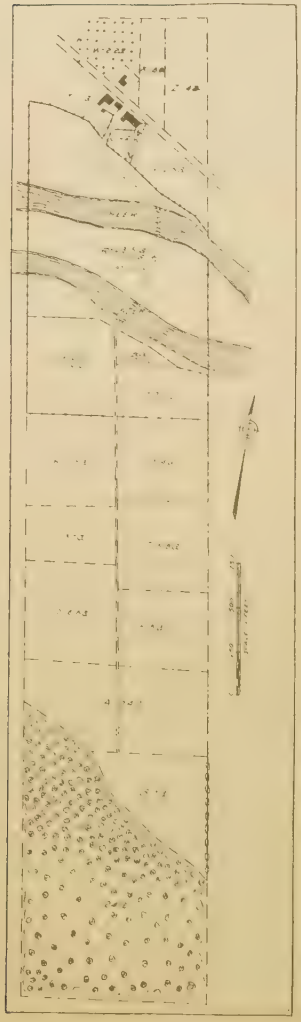

FIG. 78. A SMALL FARM DIVIDED INTO SIXTEEN SMALL FIELDS

A five-years rotation is followed. There are no interior fences nor other obstacles to prevent the enlargement of the fields

Farm area, 122 acres
Average size of farmed fields, 4.4 acres
Average distance to farmed fields, 128 rods

Under these conditions a greater number of fields would be desirable, the number and size depending on the length of the rotations and the area of land available for crops. Where truck crops are grown, many fields of small to medium size are necessary.

FIG. 79. A FARM HAVING ABOUT THE SAME CROP AREA AS THE FARM SHOWN IN FIGURE 78, BUT DIVIDED INTO SEVEN FIELDS OF GOOD SIZE AND SHAPE

A five- or six-years rotation is followed, the remainder of the land being used for minor crops. There are no road fences and the fields are farmed to the edge of the road

Farm area, 108.8 acres
Average size of farmed fields, 10.3 acres
Average distance to farmed fields, 50 rods

Physical features, such as shape of farm, differences in soil or drainage, streams, and swamps, often make it impossible to have all the farmed fields as large as the crop area and the rotation would make desirable. In such cases two, or even more, fields may be farmed together as one course of the rotation.

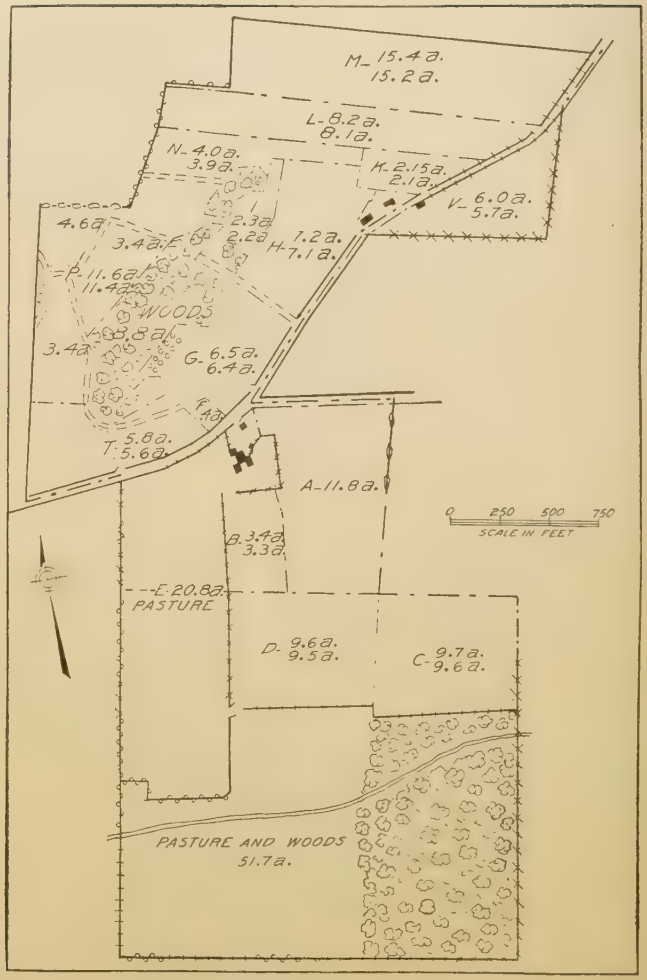


FIG. 80. A FARM OF MODERATE SIZE DIVIDED INTO NINETEEN FIELDS, MOSTLY OF SMALL SIZE

The patch of woods surrounded by crop land occupies an untillable rock outcrop

Farm area, 191.7 acres
Average size of farmed fields, 5.7 acres
Average distance to farmed fields, 77 rods

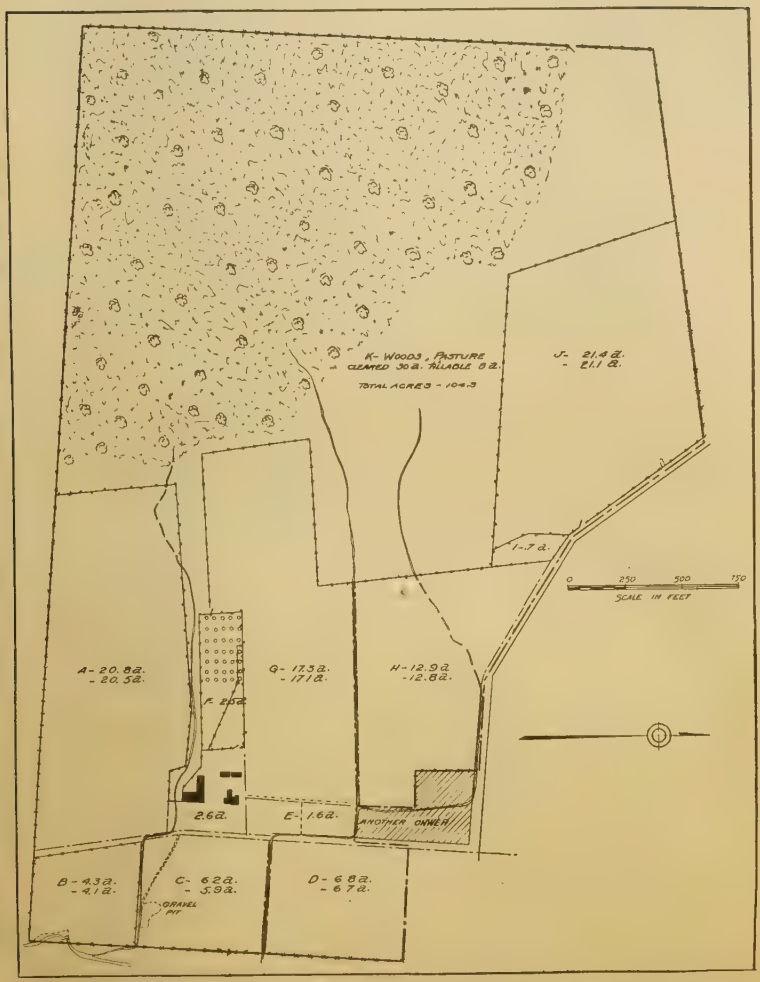


FIG. 81. ANOTHER FARM OF THE SAME SIZE AS THAT SHOWN IN FIGURE 80, BUT DIVIDED INTO FOUR LARGE FIELDS FOR THE MAIN ROTATION (CORN, OATS, HAY TWO YEARS) AND FOUR SMALL FIELDS FOR BEETS, POTATOES, ALFALFA, AND OTHER MINOR CROPS

Farm area, 205.7 acres
Average size of farmed fields, 11.2 acres
Average distance to farmed fields, 53 rods

Farm fields are often smaller than is either necessary or desirable. On many farms, little attention has been paid to the enlarging of fields to permit more effective use of labor and machinery. The crop area is still cut up into small fields by the original stone rows or fences built when the land was cleared, because it is easier in any one year to farm around

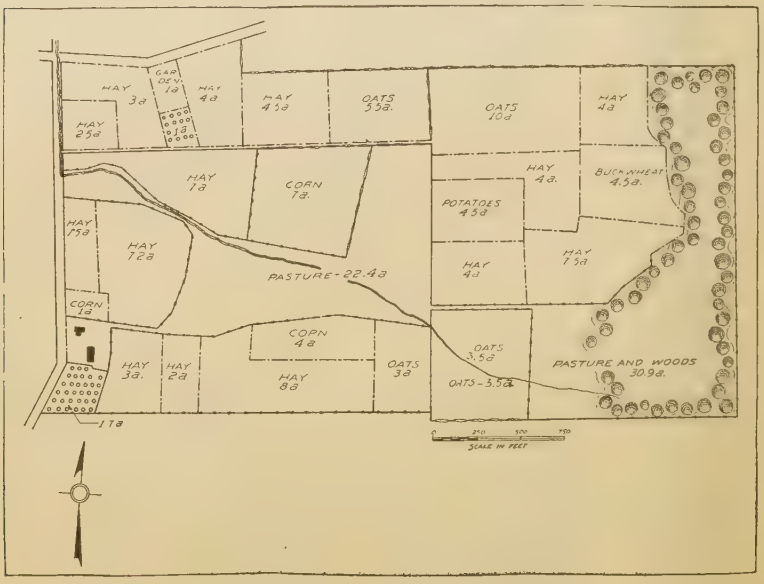


Fig. 82. An example of patch farming

The crop land was farmed in twenty-four fields averaging 4.5 acres each. There were three patches of corn, five of oats, one of potatoes, one of buckwheat, and fourteen of hay on this farm in 1914. There were few obstacles to prevent the enlarging of the fields, and this has been done since the map was made

Farm area, 212 acres
Average size of farmed fields, 4.5 acres

these obstructions than to remove them. Furthermore, there are constant forces tending toward smaller fields. Perhaps the seeding on part of a meadow fails. The patch is plowed up, and thereafter is often farmed as a separate field. A drought may prevent planting the entire field to the desired crop. The farms included in this investigation average slightly less than 100 acres of general crop land (other than fruit) to the farm,

divided into eleven fields averaging 9 acres each. On most of these farms a three- to six-years rotation is followed. The fields are smaller and more numerous than is either necessary or desirable. Very often, several small

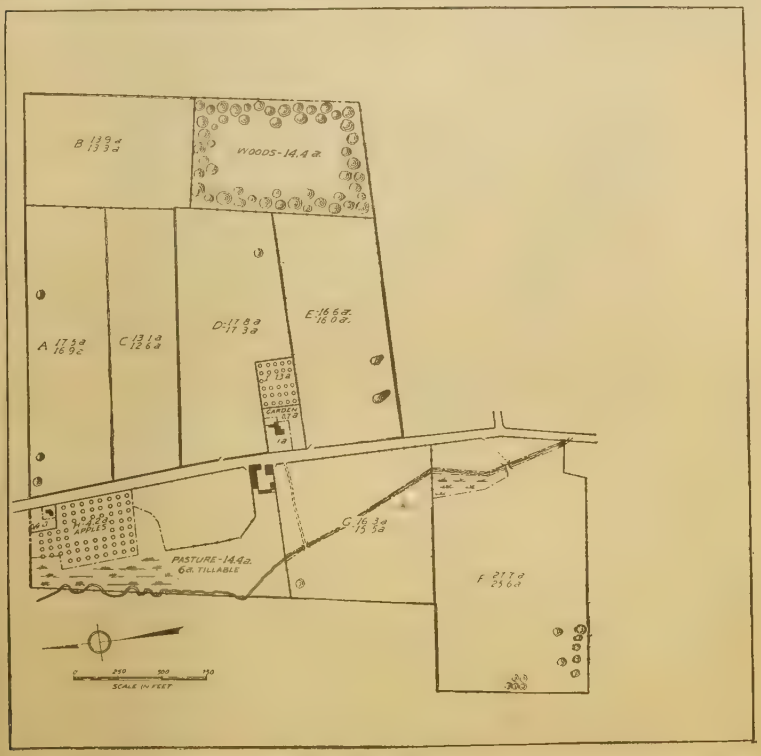


FIG. 83. A FARM SMALLER IN TOTAL AREA BUT A LITTLE LARGER IN CROP AREA THAN THAT SHOWN IN FIGURE 82

The fields are large and most of them are of good shape
Farm area, 163 acres
Average size of farmed fields, 16.7 acres
Average distance to farmed fields, 43 rods

patches of a given crop are grown on one farm without any real reason. Much time that is lost in farming these scattered patches could be saved by bringing them together into one field.

There are many factors that make difficult or even impossible the task of enlarging farm fields to the size most desirable. On some farms, physi-

FIG. 84. A LARGE FARM DIVIDED INTO TWENTY-ONE CROP FIELDS AVERAGING 12 ACRES EACH

Farm area, 293.1 acres
Average size of farmed fields, 12 acres
Average distance to farmed fields, 70 rods

cal features will partially prevent the combining of small fields into larger fields. On other farms, the prospective savings with larger fields do not justify the expense necessary to make them. On many farms, however,

the readjustments can be made very easily. In any case the problem is worthy of careful consideration.

Maps of several New York farms of various sizes, which present striking contrasts in the average size of farmed fields, are shown in figures 78 to 85 (pages 416 to 423).

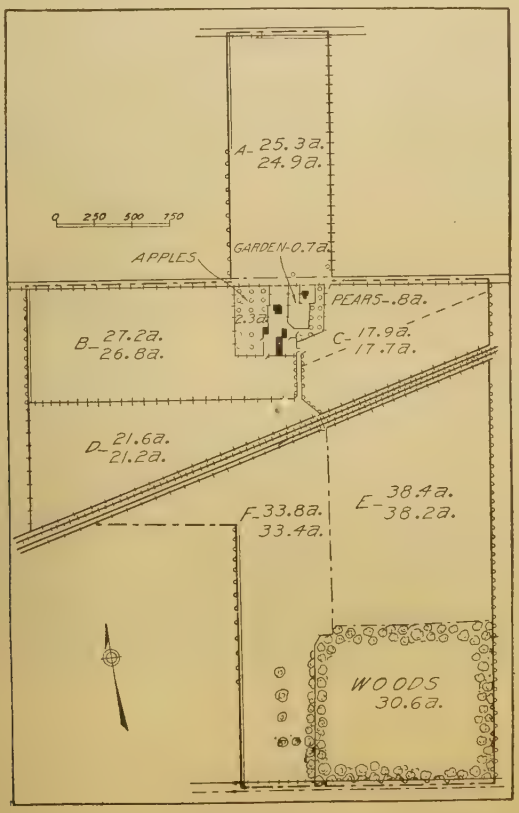


Fig. 85. A smaller farm than that shown in figure 84, but with its six crop fields averaging 27 acres each

Farm area, 204.4 acres
Average size of farmed fields, 27 acres
Average distance to farmed fields, 30 rods

## SHAPE OF FIELDS

The shape of farm fields likewise has an important effect on the economical use of labor, fencing, and land.

### *Effect of shape of fields on labor*

It is a fact commonly accepted that more time to the acre is required for performing farm operations in fields of irregular shape than in fields of regular shape. In order to determine the effect of this factor on the time required for plowing an acre, E. L. Baker kept a careful record[2] of the time required to plow fields of different shapes. The dimensions and shapes of the fields are indicated in figure 86.

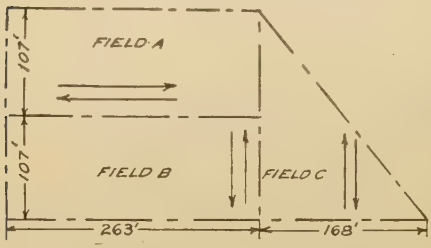


FIG. 86. DIMENSIONS AND MANNER OF PLOWING OF FIELDS OF VARIOUS SHAPES

All conditions were made as uniform as possible. Small areas were taken in order to secure uniformity of soil and moisture conditions. All the fields were plowed by the same man and team. A part of a forenoon and a part of an afternoon were spent in plowing each field in order to obviate any difference in freshness of the team. A Wiard walking plow was used, turning a furrow 14 inches wide and 8 inches deep.

Field A was plowed lengthwise, as indicated by the arrows in the diagram. Field B, equal in size to field A, was plowed the short way. Field C was triangular in shape and was plowed the long way. The time required to plow each field and the rate of plowing to the acre are shown in table 10.

Altho fields A and B are of the same size, about 14 per cent more time was required to plow field B. This was due to the shorter furrows and more frequent turns in field B, which wasted considerable time. It required 22 per cent more time to plow the triangular field C than to plow field A. Altho the average length of furrows in fields B and C are the same, seven per cent more time was required to plow field C. The

[2] Economical effects of shape and size of fields upon agriculture. By E. L. Baker. Thesis, Department of Agricultural Economics and Farm Management, Cornell University. (Unpublished.) 1909.

steadily diminishing length of furrows in field C worried the horses more than did the short furrows of the same average length in field B.

TABLE 10. Relation of Shape of Fields to Time Required to Plow an Acre

| Field | Size of field (square feet) | Time required to plow field | Time required to plow one acre at same rate |
|---|---|---|---|
| A | 28,141 | 218 min. | 5 hrs. 37 min. |
| B | 28,141 | 248 min. | 6 hrs. 24 min. |
| C | 17,976 | 170 min. | 6 hrs. 52 min. |

Any irregular shape for a farm field is undesirable. The larger the proportion of the area of a field in short rows, the worse is the shape of the field and the greater is the amount of labor wasted in farming it (fig. 87).

Fig. 87. Small, irregular fields, which waste labor and land and are expensive to fence

Triangular fields have the largest proportion of short rows and are the most wasteful of labor. Square fields are bad if they are small, because with mowing or other operations that require going around the field the bouts become extremely short near the finish; if they are large enough to be cut in two for these operations, however, they are satisfactory. For

fields of moderate size, the oblong shape is the best. The most desirable proportions depend somewhat on the size of the field and on the number of operations to be performed crosswise of the field. Oblong fields from one and one-half to three times as long as their width are usually satisfactory (fig. 88). Small fields should be proportionally longer than large fields, in order to provide longer rows. Fields long in proportion to their width are very convenient for plowing and other operations performed lengthwise, but are inconvenient for dragging or cultivating crosswise. They

Fig. 88. A large rectangular field adapted to economical operation
This field is 100 rods long and 40 rods wide

also require more travel with an empty wagon. In New York State little cultivating is done crosswise, and hence this drawback is not important. When a tractor is used, the length of the field is the most important consideration.

The importance of the effect of shape of field on labor varies inversely with the size of the field. The smaller the field, the more important is its shape; the larger the field, the less important shape becomes. Even the short rows in a large field may be longer than the longest rows in a small field. A dozen short rows in a 2-acre field may mean a considerable proportion of time wasted, while the effect of the same number of short rows on the labor necessary to farm a 20-acre field would be small.

The importance of the effect of shape of field on labor depends also on the operations to be performed, and hence on the crops grown. The more intensive crops require a greater number of operations, and therefore a

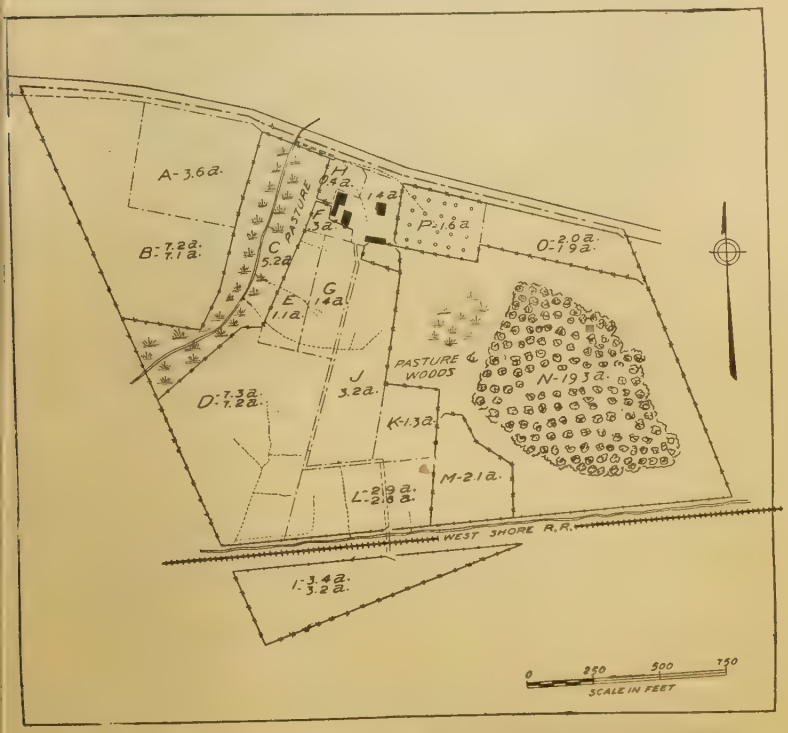


FIG. 89. A SMALL FARM IN CENTRAL NEW YORK HAVING BADLY SHAPED FIELDS

Efficient use of labor is impossible in fields like these

Farm area, 65.4 acres
Average size of farmed fields, 2.7 acres
Average distance to farmed fields, 44 rods

larger amount of time is wasted by growing such crops in irregular fields. With extensive crops such as hay or alfalfa, the waste of time in irregular fields is less important. This fact is recognized by farmers, and very badly shaped fields are usually kept in hay as much of the time as possible.

*Effect of shape of fields on economy of fencing and of land*

Square fields require the fewest rods of fence to the acre for a given size. A square field of 10 acres would require 160 rods of fence to inclose it. A rectangular field 80 by 20 rods would include the same area but would require 200 rods of fence. With the annual cost of fence maintenance at

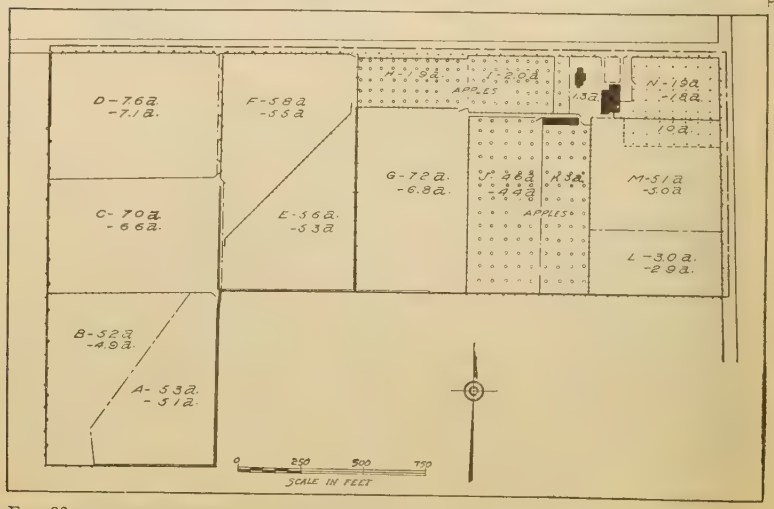


FIG. 90. A SMALL FARM IN WESTERN NEW YORK HAVING SOME WELL-SHAPED AND SOME BADLY SHAPED FIELDS

Fields A and E are hilly, and are therefore farmed separately. The unnecessary fence between fields E and F makes it impossible to farm into the sharp corner of either field. Wide fence rows, full of stone and brush, occupy 5 per cent of the crop land of this farm. Land is worth $125 an acre

Farm area, 69 acres
Average size of farmed fields, 4.5 acres
Average distance to farmed fields, 79 rods

6 cents a rod, it would cost $2.40 a year more to keep the rectangular field fenced.

*Conclusions on effect of shape of fields*

For the field of ordinary size, the oblong shape permits the most efficient use of labor, while the square shape is the most economical of fencing and of land. For pastures, therefore, the most economical shape is square, because this provides the shortest line of fence and only four corner posts.

Saving labor is usually more important than saving land and fencing, and hence oblong shapes are the most desirable for crop fields of moderate size. Very large crop fields may be square to save fencing, and yet be long enough to permit of efficient use of labor. Irregular shapes should be avoided when this is possible without too great expense.

The shape of farm fields has been affected by topography, drainage, streams, soil, and other natural factors, as well as by the manner in which

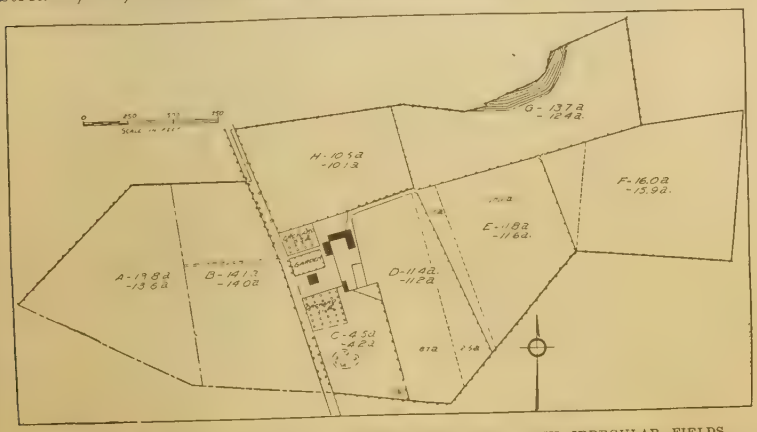


Fig. 91. A crooked farm in southern New York with irregular fields

The crooked board fence between fields D and E makes 2.5 acres of short rows in field D and 1.5 acres of short rows in field E. By straightening the fence all the short rows in field E and most of those in field D could be eliminated. The crooked outline of the farm is due to the way in which this section was surveyed

Farm area, 101.5 acres
Average size of farmed fields, 11.6 acres
Average distance to farmed fields, 48 rods

the farms were cleared. On the farms included in this investigation 42 per cent of the crop land was in fields that were approximately oblong in shape, 8 per cent was in square fields, and 50 per cent was in irregular fields. The proportion of the crop area in badly-shaped fields varies in different agricultural regions of the State, being 41 per cent on twenty-four western New York farms included in this study, 52 per cent on eleven southern New York farms, 57 per cent on twelve central New York farms, and 75 per cent on four southeastern New York farms. The worst-shaped fields are found in that part of the State which was

settled first. Fortunately, in this region a large part of the crop area is in hay, and the shape of the fields is therefore less important than if a larger proportion of intensive crops were grown. The best-shaped fields are found

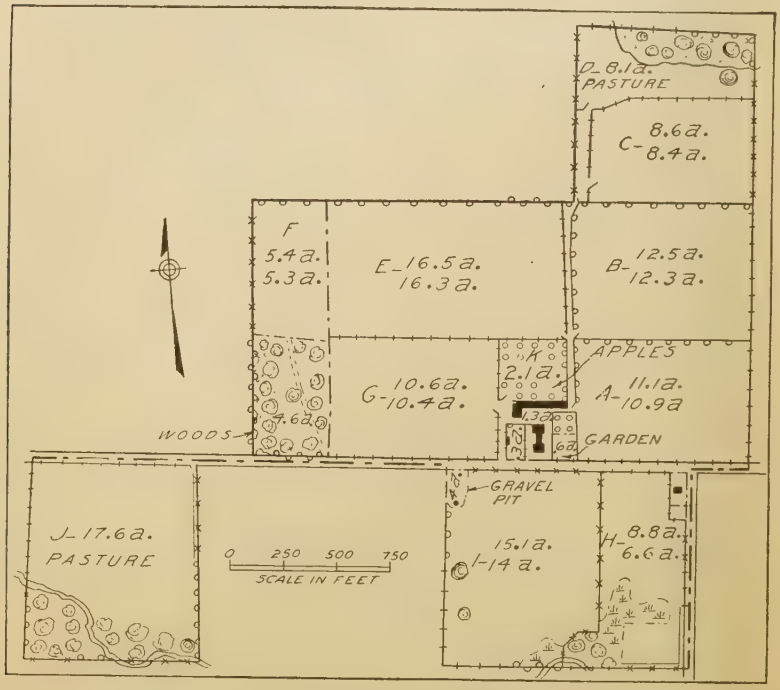


FIG. 92. A GOOD FARM LAYOUT IN CENTRAL NEW YORK

Most of the fields are of good size and shape. A four- or five-years rotation is followed. Fields A and C, B and G, H and I, and E and F have been farmed together, each pair of fields making up a course in the rotation. There are some unnecessary fences which could easily be removed

Farm area, 126.3 acres
Average size of farmed fields, 10.5 acres
Average distance to farmed fields, 32 rods

in that part of the State which was settled last, the western part. Even in this region, however, there is considerable opportunity for improvement.

In some cases the shape of the fields is the result of natural features, and rearrangement to secure fields of better shape is impossible. In

other cases the cost of improving the shape of the fields would be greater than any possible saving to be made. In many cases such improvements can be made easily and at reasonable expense. Before undertaking any

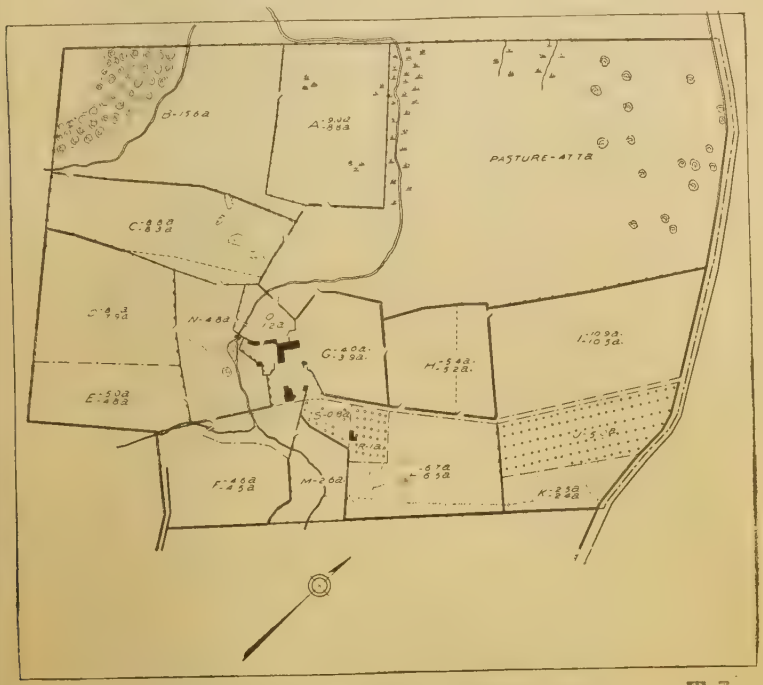


FIG. 93. LAYOUT OF A FARM IN SOUTHEASTERN NEW YORK

The irregularly shaped fields are bounded by stone fences which make rearrangement difficult. Much time is wasted owing to the small, irregular fields in this region

Farm area, 150 acres
Average size of farmed fields, 6.2 acres
Average distance to farmed fields, 47 rods

rearrangement, the probable savings and costs should be given careful consideration.

Plans of farms illustrating desirable and undesirable shapes of fields are shown in figures 89 to 95 (pages 427 to 433).

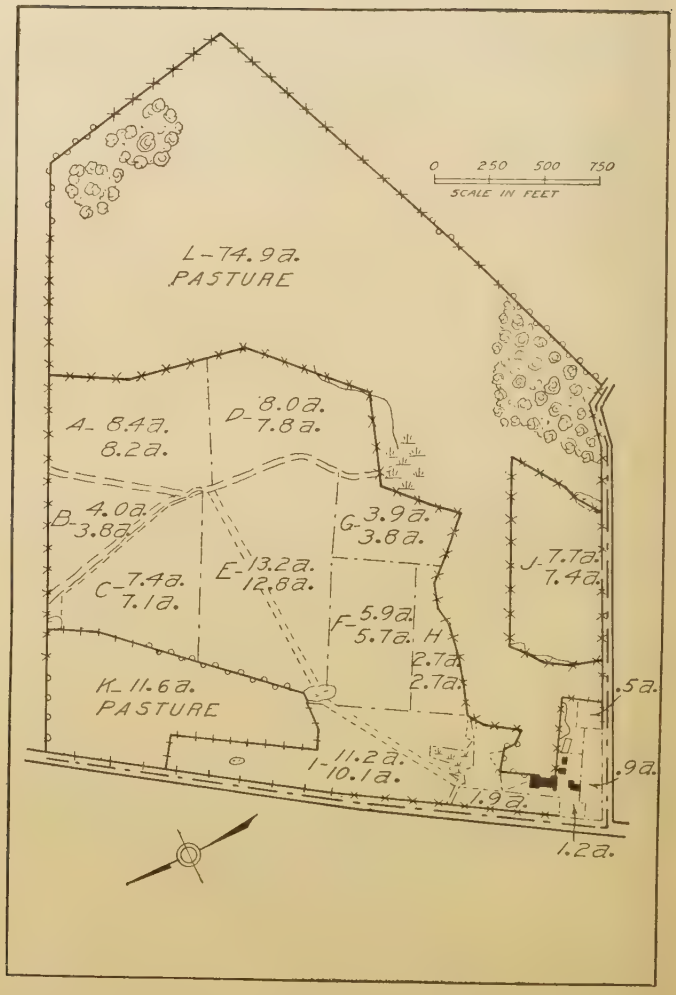


FIG. 94. A FARM LAYOUT IN NORTHERN NEW YORK

By tiling the open ditches the size and shape of these fields could be greatly improved. Some improvement could be made without any expense

Farm area, 164.5 acres
Average size of farmed fields, 6.9 acres
Average distance to farmed fields, 96 rods

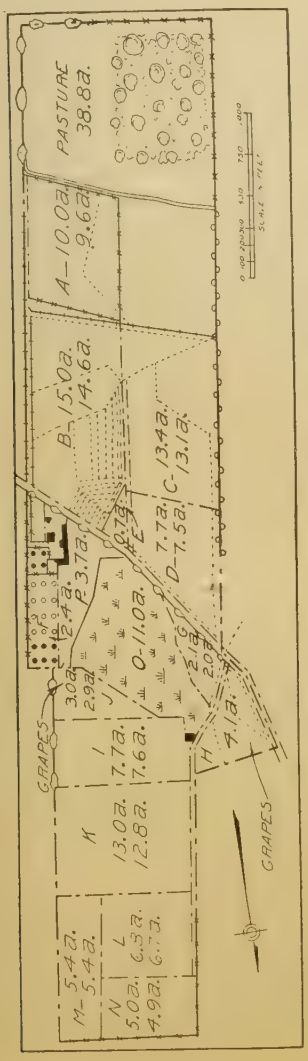


FIG. 95. PLAN OF A SOUTHWESTERN NEW YORK FARM

Farm area, 154 acres
Average size of farmed fields, 6.6 acres
Average distance to farmed fields, 92 rods]

LOCATION OF FIELDS WITH RESPECT TO BUILDINGS

Travel between barns and crop fields is not directly productive work. It is merely getting ready to do something. For this reason crop fields should be as readily accessible to the farmstead as possible.

The importance of the effect of this factor depends principally on the distance traveled and on the crops grown. For any given rotation of crops, the relative values of near-by and distant fields can be easily determined. With a five-years rotation of silage corn, oats, wheat, hay, the minimum number of trips to the acre, with average yields, would be about as follows:

| | Man trips to the acre | Horse trips to the acre |
|---|---|---|
| Silage corn (including 10 loads of manure to the acre) | 18.0 | 48.0 |
| Oats | 3.5 | 8.0 |
| Wheat | 3.5 | 8.0 |
| Hay | 2.1 | 3.8 |
| Hay | 2.1 | 3.8 |
| Total above rotation | 29.2 | 71.6 |
| Annual average for above rotation (approximately) | 6 | 14 |

If a field is a half mile distant from the barn, each round trip means a mile of travel, or at least 6 man miles and 14 horse miles of travel for each acre each year with the above rotation. This would require at least 2 hours of man time and 4.5 hours of horse time, which, at 30 cents an hour for man labor and 20 cents an hour for horse labor, would cost about $1.50. Since $1.50 is 6 per cent interest on $25, it is evident that a field adjoining the barn would be worth about $25 an acre more for general farming than an equally good field a half mile away under the conditions given.

The average distance between farmstead and fields depends chiefly on the size of the farm, the shape of the farm, the location of the farmstead with respect to the fields, and the size and arrangement of the fields. Other factors remaining constant, the larger the farm, the greater is the distance between farmstead and fields. This is one of the most important factors limiting the size of farms. If the size of a farm be indefinitely

ncreased, a point will be reached where the advantages of greater size are offset by the time lost in travel between buildings and fields. Any further increase in size then means a duplication of buildings.

The shape of the farm is nearly as important as the size in its effect on distance to fields. All long, narrow shapes are bad, since they mean that much of the land is farther from the buildings than it would be if the farm were more nearly square (fig. 96). Square or nearly square farms permit the most convenient arrangement of fields with respect to buildings (fig. 97). The ideal arrangement is to have half of the land on each side of the highway, with the buildings in the center of the farm (fig. 98). By this arrangement the travel to fields may be reduced to a minimum, and yet the advantages of living on the highway are retained. With any shape of farm and with the usual systems of farming, the most advantageous location for the buildings from the standpoint of labor efficiency is in the center of the crop land; but if this necessitates locating the buildings away from the highway, the disadvantages of the plan more than offset the saving of labor except in the case of very large farms. It is in some cases possible to put the house on the road by running a road thru the farm. When this can be done, the advantages to be gained much more than offset the value of the land lost. A location in the middle of the side of the farm on the road, is usually preferable to one in the corner nearest town.

It is usually desirable to have as many fields as possible corner on the farmstead. Often the average distance to the nearest corner of the crop fields can be reduced by enlarging the fields.

Because of the greater cost of farming distant fields, farmers tend to keep such fields in less intensive crops. In New York, fields too remote to be cultivated economically are kept in hay almost continuously. If the hay from such fields is to be sold, it is usually stacked or drawn to a nearby barn rather than to the main buildings. Fields too distant to be profitably cropped with hay are used for pasture. By such plans farmers have adjusted their practice to make the best of bad field arrangements.

On many farms, the remote fields are never manured and are continually getting poorer. Frequently such fields, too distant to be farmed economically by their owner, are directly across the road from a neighbor's house. The best way to put the buildings in the middle of the farm is to buy the land across the road when this is possible.

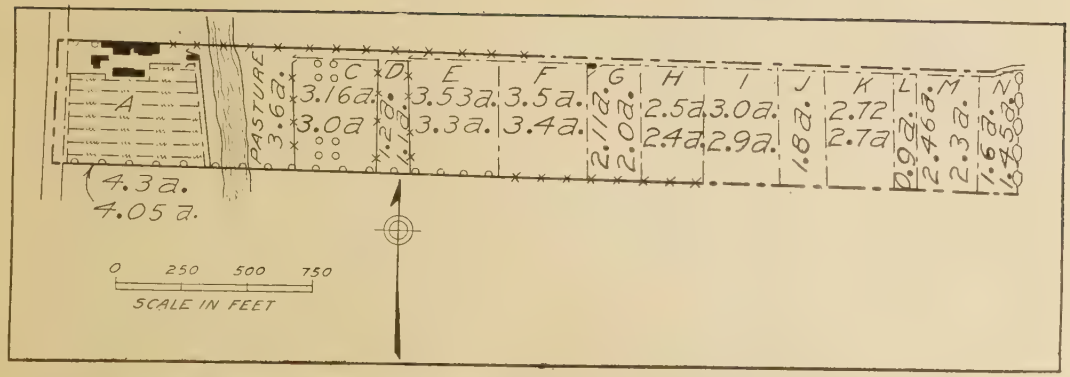


FIG. 96. PLAN OF A SMALL FARM SHOWING THE EFFECT OF SHAPE OF FARM ON DISTANCE TO FIELDS

The average distance to the nearest corners of the crop fields is 102 rods; the average distance to the centers of the crop fields is 116 rods. The average distance to the corners of the fields is greater than for the farm shown in figure 97, which is about ten times as large. The average distance to the centers of the crop fields is approximately the same for the two farms. For a well-laid-out square farm of the same size as the one shown in this figure, the average distance to the fields would be about 20 rods. With 1918 labor prices the saving of travel would make the square farm worth from $10 to $15 an acre more for general farming than an equally good farm with the arrangement shown here

Farm area, 37.9 acres
Average size of farmed fields, 2.4 acres
Average distance to farmed fields, 102 rods

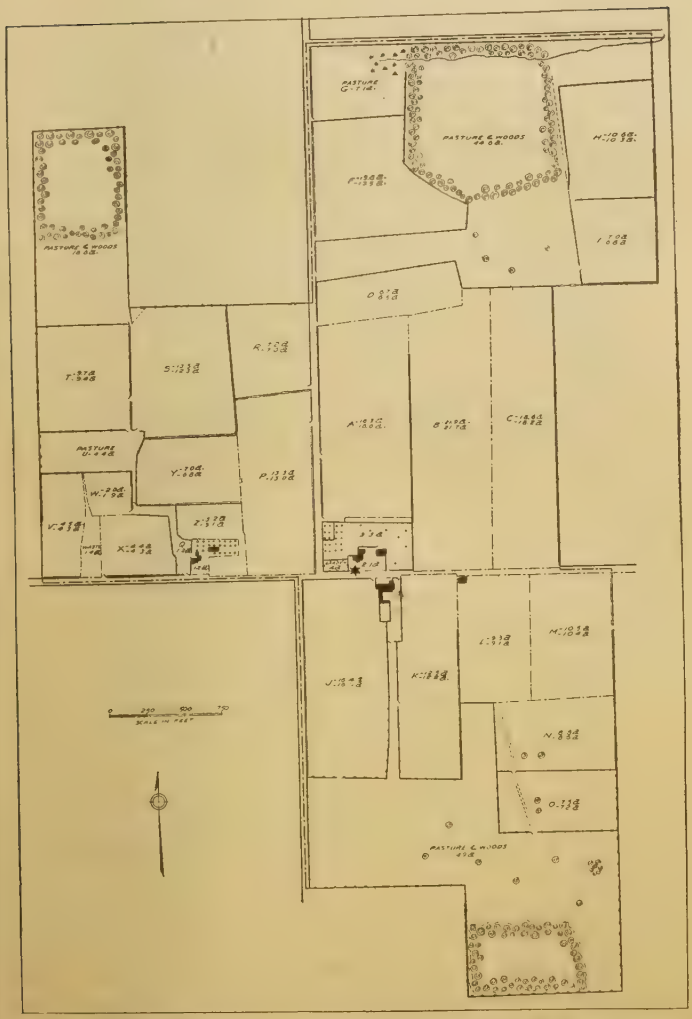

FIG. 97. A MUCH LARGER FARM THAN THAT SHOWN IN FIGURE 96, BUT WITH ABOUT THE SAME AVERAGE DISTANCE TO FIELDS

This farm is made up of four original farms. Many fields have been combined and enlarged and the process is still going on. Most of the fields are of good size and shape, but there is opportunity for further improvement

Farm area, 369.1 acres
Average size of farmed fields, 10.1 acres
Average distance to farmed fields, 86 rods

As has previously been pointed out, the inaccessibility of the fields on many farms is a natural consequence of the way in which farm layouts have developed. In the first place, little attention was paid to this consideration in laying out farms for settlement. Again, as farms have

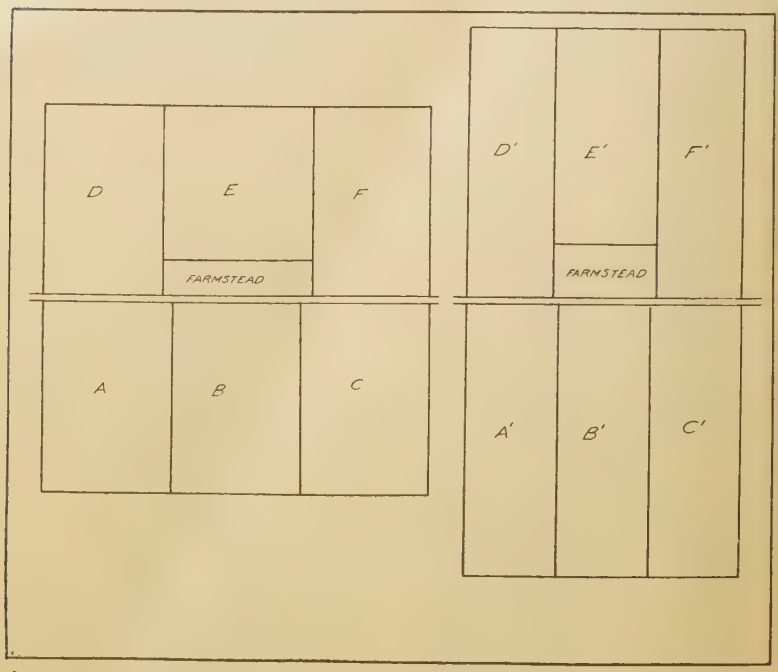


Fig. 98. TWO GOOD FARM LAYOUTS

If a 160-acre farm had either of these field arrangements, the average distance to fields would be less than 30 rods

been combined it has not always been possible to buy land adjacent to the farm already owned. Just as the layout of some farms has been improved by combination, that of others has been made worse. Within reasonable limits it is more important to have enough land than to have it convenient for working; or, in other words, the advantage of having more land may offset the disadvantages of an inconvenient location.

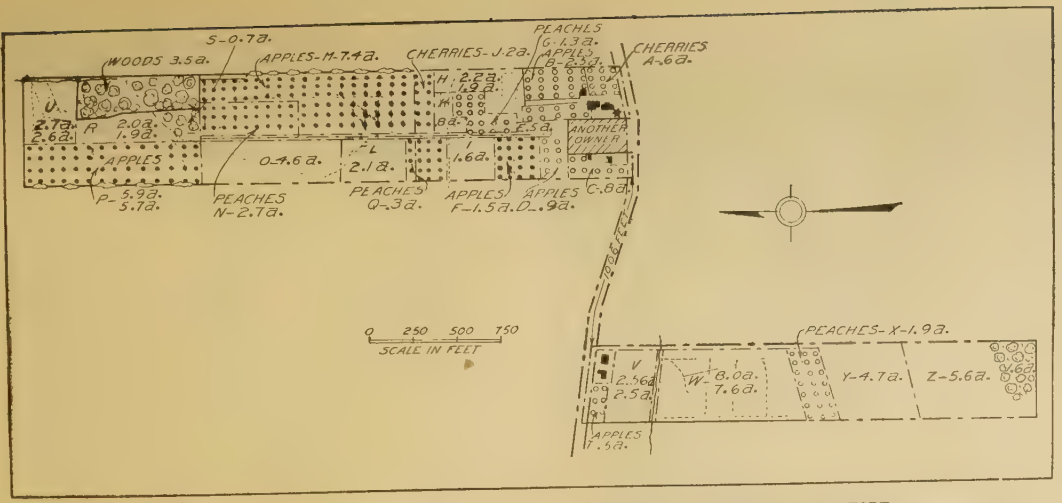


FIG. 99. PLAN OF A FARM IN THE INTENSIVE FRUIT BELT OF WESTERN NEW YORK

Such long, narrow farms mean much travel to and from fields. The field arrangement is made worse by the separation of the two parts of the farm. With the crops grown, and with 1918 labor prices, the distance of 60 rods between the two parts means a difference of $15 or $20 an acre in the value of the land for farming. The woodlot occupies tillable land too valuable for forestry purposes and is being cleared

Farm area, 74.8 acres
Average size of farmed fields, 2.6 acres
Average distance to farmed fields, 108 rods

It is probably worth while to see what an ideal arrangement is like, even tho such an ideal is unattainable in most cases. Realizing the importance of a convenient arrangement, one can plan an arrangement

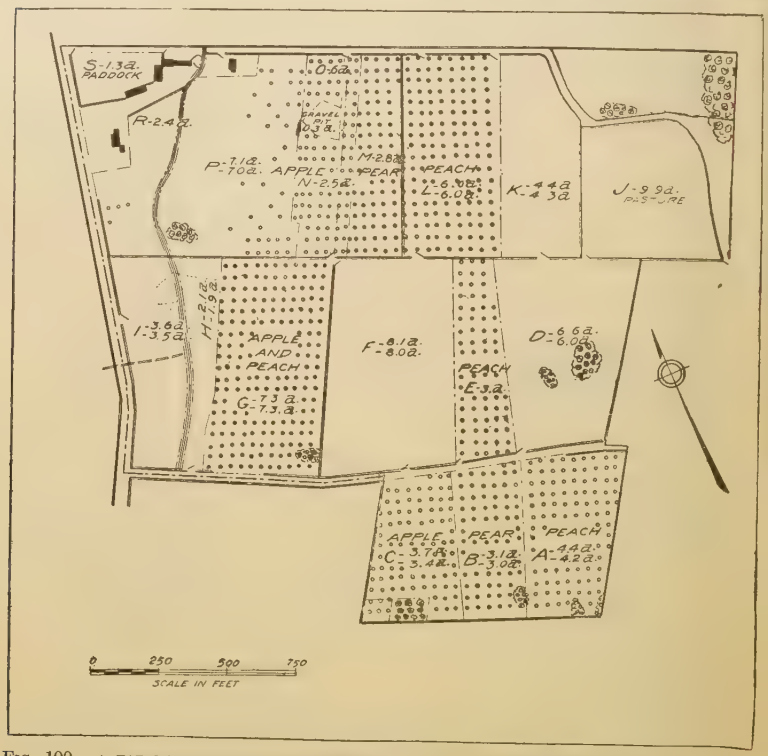


FIG. 100. A FARM PLAN WITH THE FARMSTEAD IN THE CORNER MOST DISTANT FROM THE FIELDS, THE WORST POSSIBLE ARRANGEMENT

This farm might be four times as large with no great r average distance to the fields. Such a plan has the principal disadvantages of a farm four times as large, with none of the advantages

Farm area, 83.6 acres
Average size of farmed fields, 4.1 acres
Average distance to farmed fields, 91 rods

for his farm which will approximate this ideal as closely as conditions permit. Farms illustrating good and poor arrangements with regard to this factor are shown in figures 99 to 111 (pages 439 to 451).

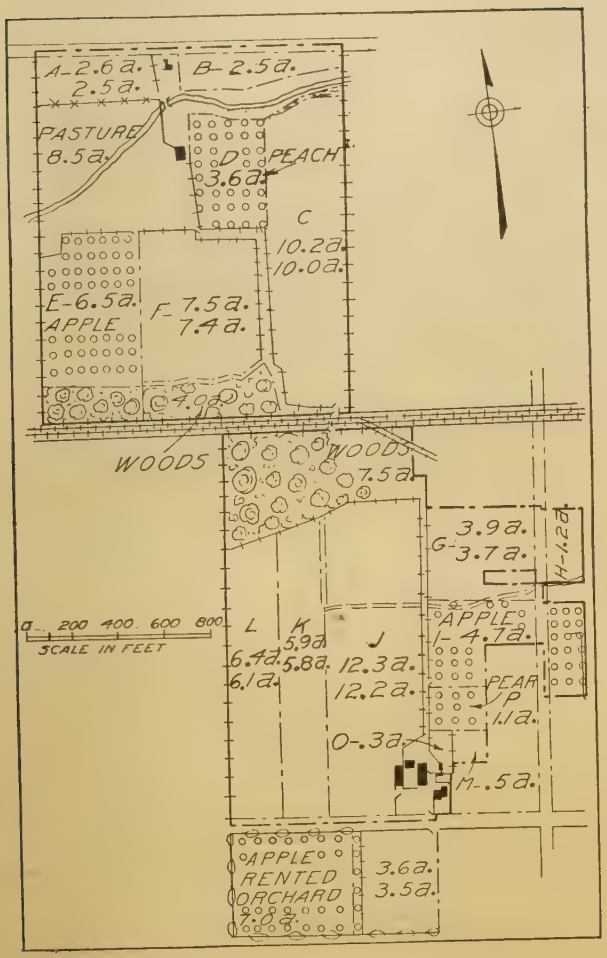


Fig. 101. A fruit farm in western New York

The part north of the railroad was originally a separate farm. The average distance to fields is as great as for many farms three or four times as large. The woodlot occupies tillable land which is too valuable for producing lumber

Farm area, 97.5 acres
Average size of farmed fields, 5.1 acres
Average distance to farmed fields, 90 rods

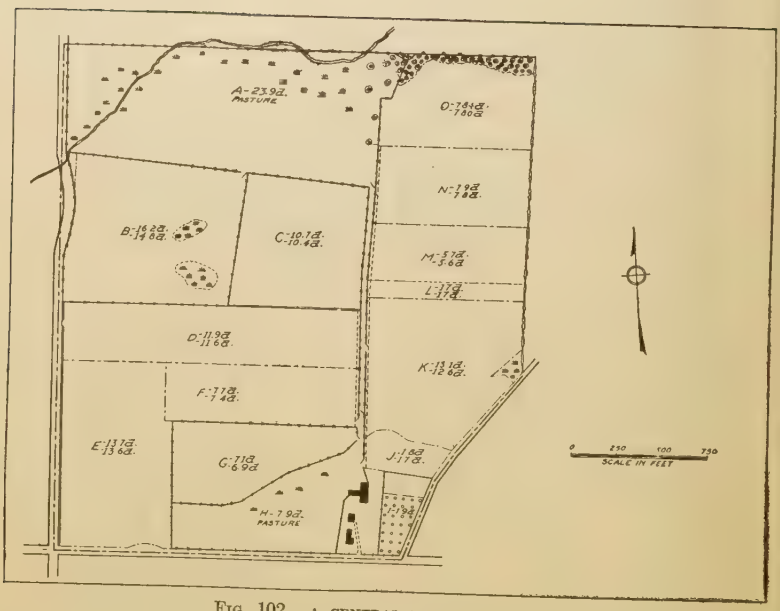


FIG. 102. A CENTRAL NEW YORK FARM

There are few interior fences or other barriers to prevent planning a satisfactory field arrangement for this farm

Farm area, 146.5 acres
Average size of farmed fields, 8.5 acres
Average distance to farmed fields, 70 rods

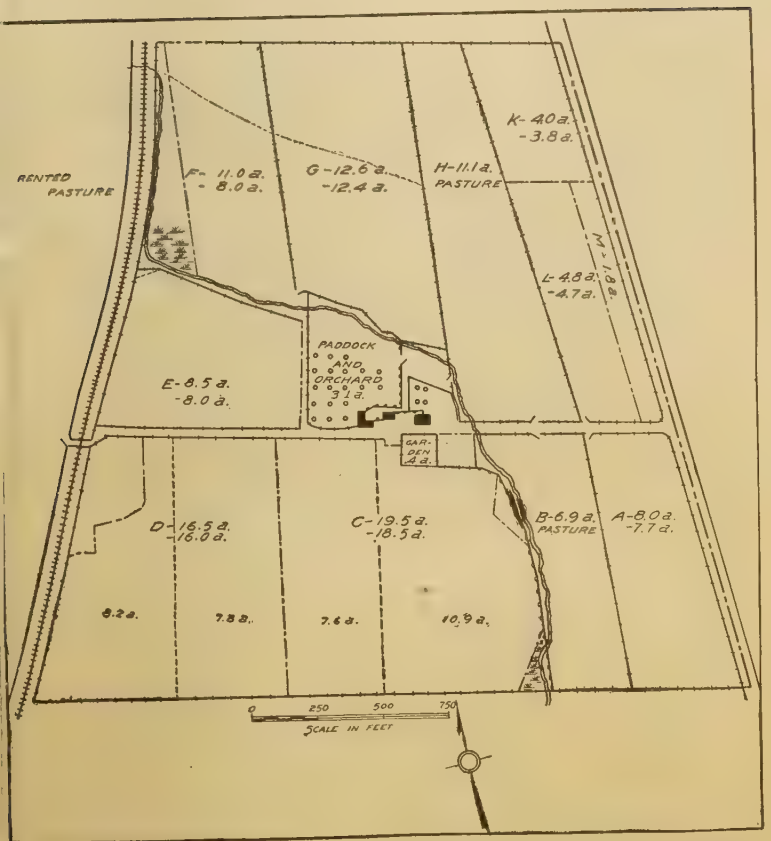


FIG. 103. A WESTERN NEW YORK FARM ON WHICH THE FARMSTEAD IS IN THE CENTER, AWAY FROM THE MAIN ROAD

The farmstead was originally located in field K. There is no suitable building site along the highway because the highway is so much above the adjoining land. Under these conditions the present location is the best possible

Farm area, 114.5 acres
Average size of farmed fields, 9.1 acres
Average distance to farmed fields, 35 rods

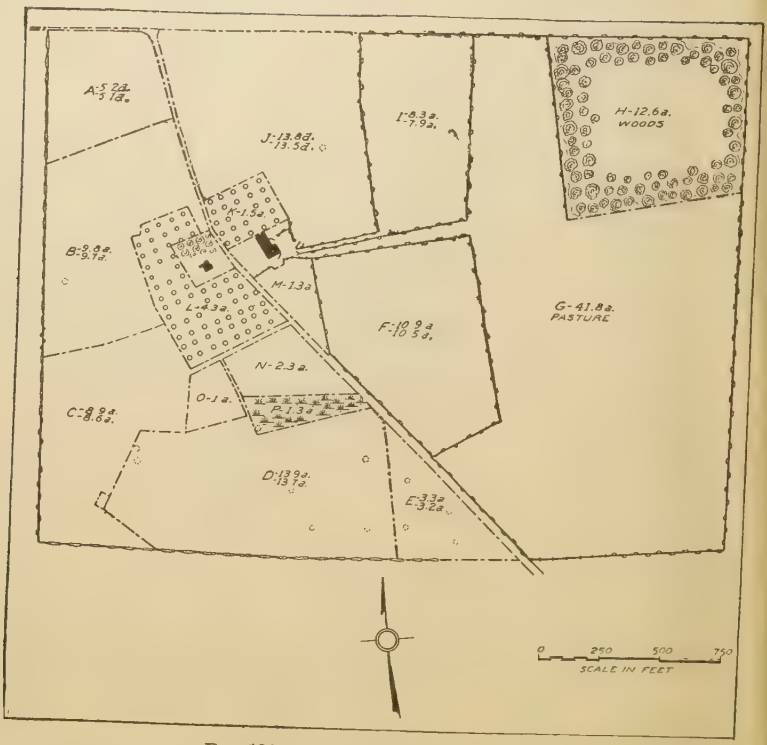


FIG. 104. A SOUTHERN NEW YORK FARM

The farmstead is situated in the center of the crop area, on the road. The average distance to fields is about one-fourth that on the farm shown in figure 99. The deed of this farm specifies 100 acres, more or less

Farm area, 144.5 acres
Average size of farmed fields, 6.3 acres
Average distance to farmed fields, 29 rods

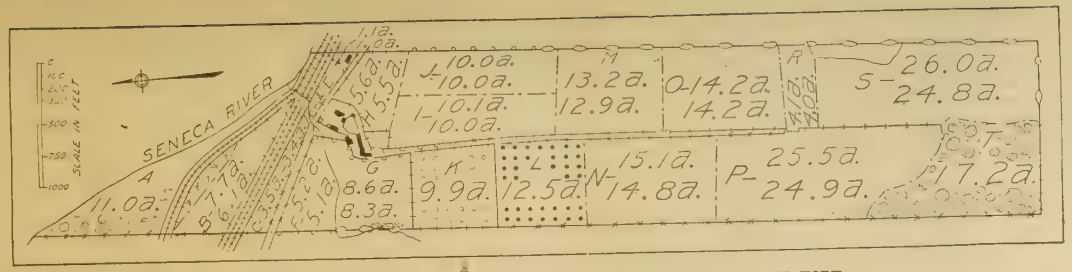


FIG. 105. A LARGE FARM WITH A POOR LAYOUT, IN CENTRAL NEW YORK

Land at the back end of this farm is too remote to be farmed economically by the owner, but is convenient to neighboring farmsteads. In 1916 and 1917 a total of 50 acres of land lay fallow largely because it was too far away. It is 240 rods from the horse barn to the nearest corner of field S, which, with man labor at 30 cents and horse labor at 20 cents an hour, would make that field worth from $35 to $40 an acre less for general farming than the field adjoining the barn. The farm is worth $100 an acre

Farm area, 210.3 acres
Average size of farmed fields, 10.5 acres
Average distance to farmed fields, 126 rods

FIG. 106. ANOTHER POOR LAYOUT

The fields on this farm are small and irregular, and the farmstead is as far from the fields as possible. Many of the fence rows are so full of stone that it would not pay to clear them. The crooked fields are not due to topography, but largely to the manner of clearing

Farm area, 211.1 acres
Average size of farmed fields, 7.8 acres
Average distance to farmed fields, 113 rods

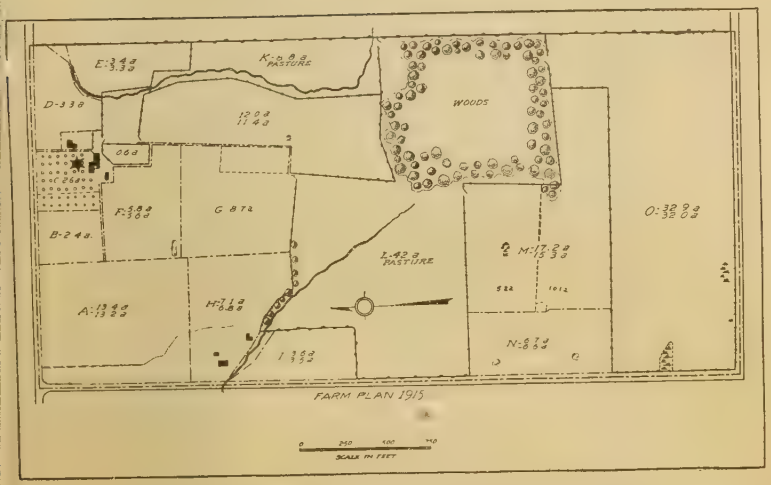


FIG. 107. A COMMON FARM LAYOUT IN WESTERN NEW YORK

Field O, at the back end of this farm, is directly across the road from the house of an adjoining farm. This field is 183 rods from the owner's barn, up hill, and is too far away to be cropped economically even tho it is the best field on the farm. It should be worth from $25 to $30 an acre more to the neighbor than to the present owner

Farm area, 175.8 acres
Average size of farmed fields, 8.7 acres
Average distance to farmed fields, 104 rods

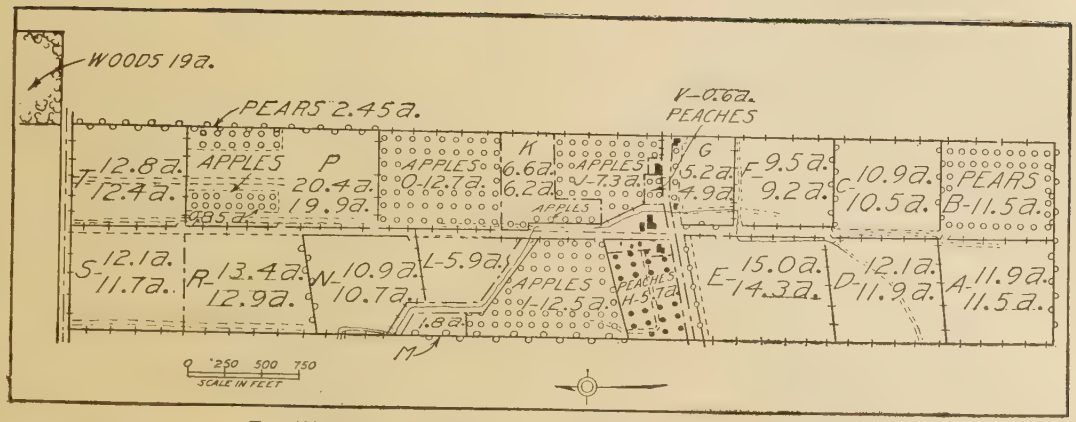


FIG. 108. A MUCH BETTER PLAN THAN THAT SHOWN IN FIGURE 105

Altho the farms are of nearly the same proportions, the farmstead in this case is nearer the center of the farm

Farm area, 228.2 acres
Average size of farmed fields, 9.7 acres
Average distance to farmed fields, 87 rods

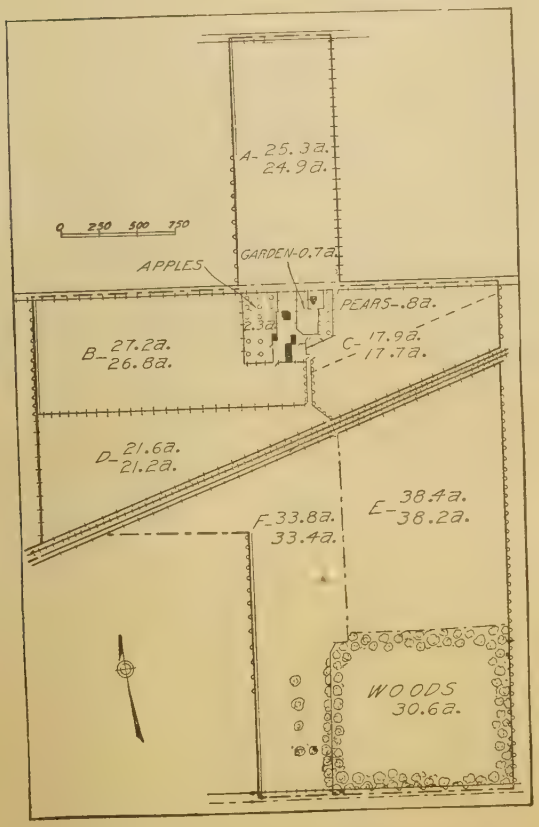


FIG. 109. A GOOD FARM LAYOUT IN WESTERN NEW YORK

All of the fields can be reached from the farmstead with a minimum of travel. The fields are large, but some of them are very irregular. Field A has rows 100 rods long and is almost ideal for efficient operation

Farm area, 204.4 acres
Average size of farmed fields, 27 acres
Average distance to farmed fields, 30 rods

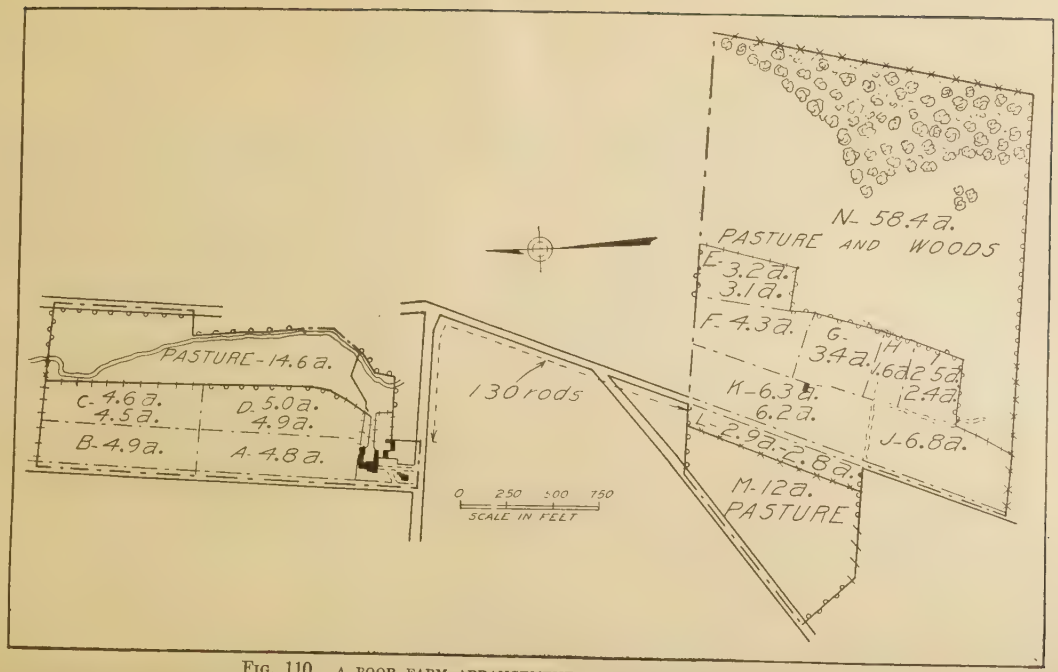


FIG. 110. A POOR FARM ARRANGEMENT IN SOUTHERN NEW YORK

Land across the road from the main farmstead would be worth $20 an acre more than the land 130 rods away which is being farmed. This farmer has since purchased the farm across the road from the main farmstead

Farm area, 140 acres
Average size of farmed fields, 4.4 acres
Average distance to farmed fields, 127 rods

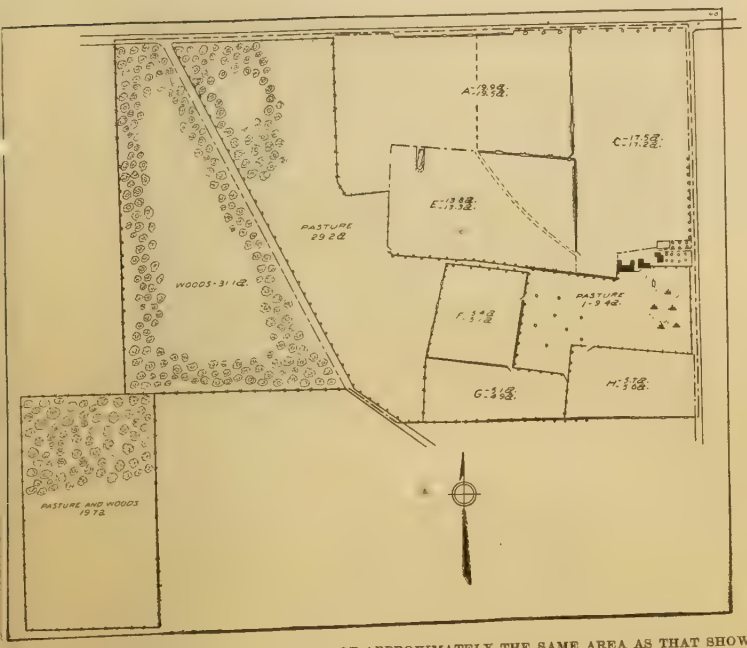


FIG. 111. A CENTRAL NEW YORK FARM OF APPROXIMATELY THE SAME AREA AS THAT SHOWN IN FIGURE 110, BUT WITH AN AVERAGE DISTANCE TO FIELDS ONLY ONE-FOURTH THAT OF THE OTHER FARM

Obviously this farmer has a decided advantage in producing crops

Farm area, 162 acres
Average size of farmed fields, 10.9 acres
Average distance to farmed fields, 33 rods

### OBSTRUCTIONS IN FIELDS

The difficulties in farming the small, irregularly shaped fields found on many farms are in some cases further increased by obstructions of various kinds. Not only do these obstructions waste land, but, what is usually more important, they waste labor in farming around them.

#### *Swampy spots*

Wet, swampy spots in cultivated fields are frequently found on farms located on the heavier soils of the State. On the fifty-three farms included in these studies a total of more than 30 acres of land in cropped fields was occupied by such waste areas, or an average of nearly 0.6 acre for each farm. In addition to this, much crop land needs some drainage. The area given includes only land in cropped fields actually untillable because too wet.

Not only do these wet, swampy places waste land that is otherwise good, but they hinder the cultivation of the remainder of the fields in which they are located. Where such areas can be drained easily, it frequently pays to drain them because of the saving of land and labor.

The plan of a western New York farm is shown in figure 112. In 1917 the swampy patch in field R was drained by a line of tile running to the corner of the open ditch in field B. Sixty rods of tile was necessary. The total cost of the job including work and tile, as shown by cost accounts, was $103, or approximately $1.70 a rod. Six-tenths of an acre of crop land, worth $60, was gained. The net cost of the improvement was, therefore, $43. The work was done by farm labor at odd times. At the same time the brush row between fields P and R was cleared, permitting fields P, R, and S to be farmed as one field of 21 acres. This arrangement allowed the elimination of the driveway to field S. The saving in land and labor with the new arrangement will pay for the entire cost in a few years.

#### *Open ditches and streams*

On the farms studied, a total of 37.2 acres of land in cropped fields, or an average of about 0.7 acre for each farm, was occupied by open ditches or by streams (figs. 113 and 114). Open ditches are continually filling up with dirt and weeds, so that the annual upkeep is a considerable item. More important is the fact that they often divide the crop land into fields of irregular shape.

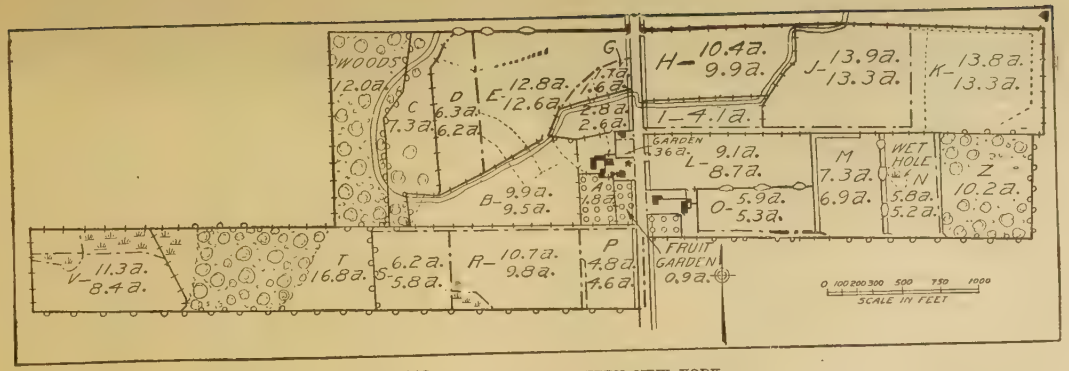


FIG. 112. A FARM IN WESTERN NEW YORK

In 1917 the swampy hole containing 0.6 acre in field R was drained by a line of tile running to the corner of the open ditch in field B. At the same time the brush row between fields P and R was cleared, allowing fields P, R, and S to be combined into one field of 21 acres

Farm area, 193.1 acres
Average size of farmed fields, 7.4 acres
Average distance to farmed fields, 73 rods

Frequently the possible saving of land and labor justifies the elimination of these obstructions to cultivation. An improvement of this kind is shown in figures 115 and 116. Plan I in figure 115 shows the layout of 50 acres which form part of a farm of 160 acres. The open ditch shown in this plan divided this area, as indicated, into irregular fields. With all

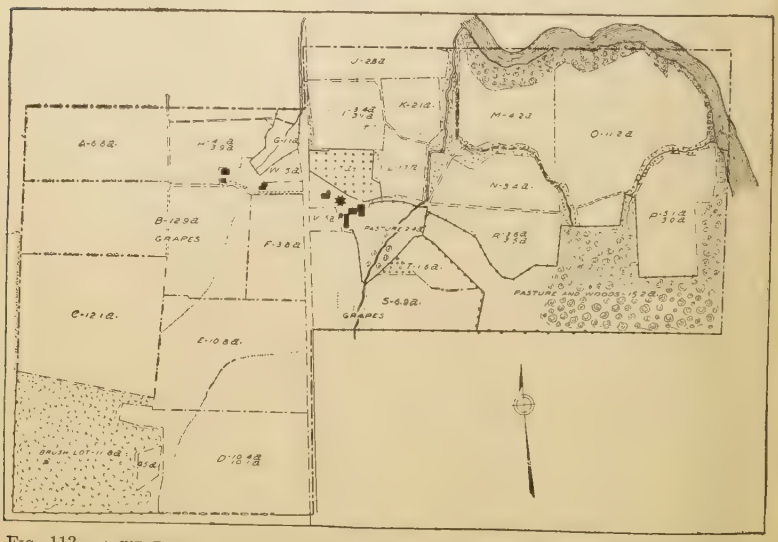


Fig. 113. A western New York farm having many fields of irregular shape, most of these being due to open ditches grown up to alders. The ditches could be easily tiled

Farm area, 153.3 acres
Average size of farmed fields, 5.9 acres
Average distance to farmed fields, 53 rods

the fields in corn there would have been more than two hundred short rows. The ditch was grown up to brush and wasted a considerable area of land.

In the fall of 1916 this ditch was tiled up to the south end of field T. In the spring of 1917 the land along the ditch was cleared and plowed for cropping. The costs of making this improvement were as follows:

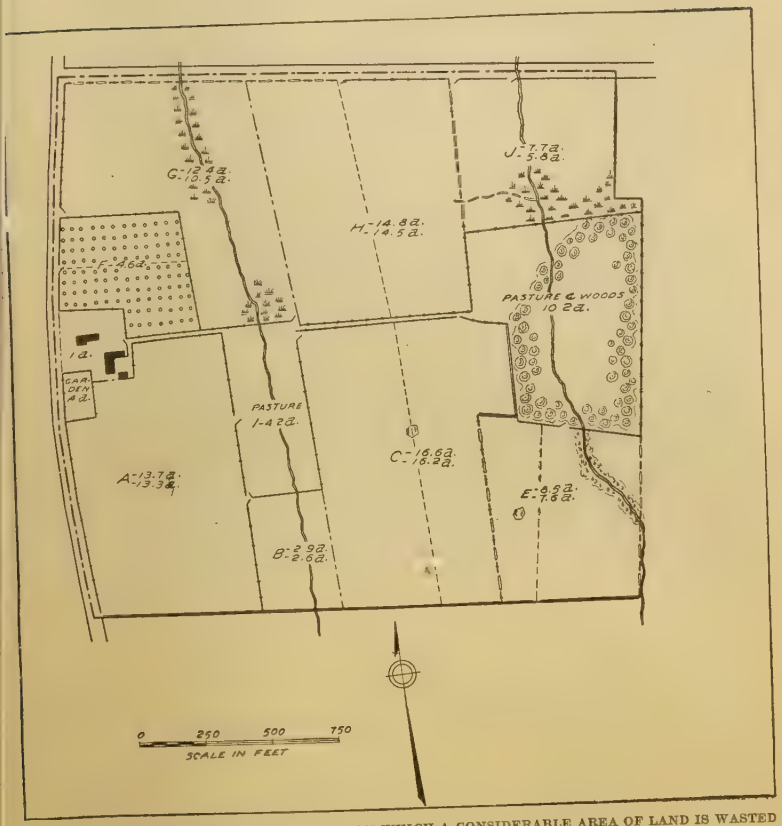


FIG. 114. A WESTERN NEW YORK FARM ON WHICH A CONSIDERABLE AREA OF LAND IS WASTED BY STREAMS

The small stream in field G wastes 1.7 acres of land and makes the remainder of the field difficult to farm. By deepening and straightening the stream bed, or by tiling it, this field could be greatly improved. About the same area of land is wasted by another small stream in field J. Land is worth $100 an acre here

Farm area, 100.2 acres
Average size of farmed fields, 9.4 acres
Average distance to farmed fields, 54 rods

| | |
|---|---|
| Cost of 123 rods of tile drain: | |
| 1000 two-inch tile, 14 inches long | $16.32 |
| 350 three-inch tile, 14 inches long | 8.75 |
| 325 four-inch tile, 14 inches long | 14.62 |
| 55 six-inch tile, 14 inches long | 3.85 |
| 1 roll roofing to cover joints | 2.50 |
| 331 hours man labor | 44.12 |
| 98 hours horse labor | 9.80 |
| 98 hours use of equipment | 2.94 |
| Total cost of 123 rods of tile drain | $102.90 |
| Cost per rod | 0.84 |

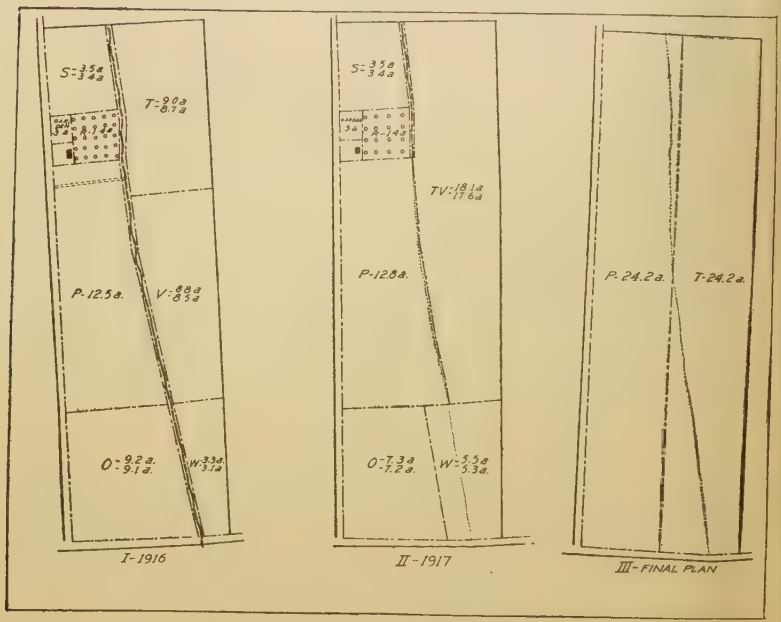


FIG. 115. PLANS OF A 50-ACRE TRACT SHOWING ARRANGEMENT BEFORE AND AFTER TILING AN OPEN DITCH

In the fall of 1916 and the spring of 1917, the open ditch was tiled as shown and the land formerly occupied by it was cleared for cropping. After completing the tiling, clearing the worthless orchard, and moving the tenant house, the owner will work the tract in two large, oblong fields, as shown in III

| | |
|---|---|
| Cost of clearing land for cultivation: | |
| 49 hours man labor | $ 7.39 |
| 74 hours horse labor | 15.16 |
| 74 hours use of equipment | 2.63 |
| Total cost of clearing land for cultivation | $25.18 |
| Total cost of laying tile and clearing land | $128.80 |
| Cost per rod of laying tile and clearing land | 1.04 |

Fig. 116. The same field (fig. 115) in 1918 after the tiling of the open ditch and the clearing of the land for cultivation

One acre of land, worth $75, was gained, making the net cost of the improvement $53.08. The saving in labor made possible by enlarging and improving the shape of the fields will pay this in a short time. The work was all done by farm labor in the late fall and early spring, when other work was not pressing.

Plan III shows this owner's ultimate plan for this part of his farm. The house shown in Plan II is too far away from the main farmstead and will be moved to a more convenient location. The apple trees have never borne a commercial crop. They will be cut for firewood and the remainder of the ditch will be tiled, making possible the division of this tract into two rectangular fields of 24.2 acres each, 160 rods long. Since a tractor is used on this farm, the new arrangement will make possible an important saving in labor.

*Stone piles*

The abundant crop of stones found on a large part of the farm land of the State has given rise to many farm layout problems. In early days, when labor was cheap, stone fences furnished an excellent way of getting

Fig. 117. SMALL, SCATTERED STONE PILES WHICH WASTE BOTH LAND AND LABOR

Fig. 118. A LARGE STONE PILE IN THE CORNER OF A CROP FIELD

This stone pile occupies little land and does not interfere with cultivation. The stones are convenient for drawing if needed for improved highways

d of surplus stones. In more recent times, changed conditions have made tone fences not only too expensive to build but also undesirable. On nany farms the surplus stones have been thrown into small piles scattered .t random over the different fields (fig. 117). Not only do such piles waste nore land than do larger piles (fig. 118), but they waste labor in farming around them.

*Trees*

Some trees in pasture fields are desirable or shade; but trees in cultivated fields are inconvenient to farm around, and they damage the crop for a considerable area. On one of the farms included in this study a worthless apple orchard was cleared for cultivation in 1916. There were twenty-seven trees from sixty to seventy years old, averaging from 18 to 24 inches in diameter. They occupied an area of 0.6 acre. The cost of cutting the trees and clearing the land for cultivation was as follows:

| | |
|---|---|
| 50 pounds dynamite and wages of expert | $17.00 |
| 239 hours man labor | 31.86 |
| 36 hours horse labor | 3.59 |
| 36 hours use of equipment | 1.04 |
| Total cost | $53.49 |

Six cords of 4-foot firewood was cut, worth $6.50 a cord, or a total of $39. Six-tenths of an acre of crop land, worth $45, was gained. In this case the cost of clearing the orchard was more than paid by the value of the wood and of the land gained.

## FENCES

The early settlers on New York farms made fences of rails, stumps, or stones, or of combinations of these materials. These fence rows were difficult to mow and keep cleared, and consequently were ideal for the propagation of brush and trees. As more surface stones were picked up from the land, they were often thrown into the fence rows. Changing conditions have made desirable the elimination of many fences in order to permit the enlargement of fields, but the wide, stony, brush-grown fence rows have proved a serious obstacle to this change. The increase in land values has made the land occupied by fences a factor worthy of con-

sideration. Labor is no longer cheap, and fencing materials must be purchased at increasing prices. As a result of these changes, the problem of fencing farms suitably and economically has become an important one.

The various kinds of fences found on the fifty-three farms studied are given in table 11, together with data concerning the amount of each kind found:

TABLE 11. Kinds of Fences and Amounts of Each on 53 New York Farms

| Kind of fence | Total length of fence | | Length of fence per farm (rods) | Per cent of total fencing |
|---|---|---|---|---|
| | Rods | Miles | | |
| Woven wire | 28,355.0 | 88.6 | 535.0 | 35.3 |
| Barbed wire | 26,797.5 | 83.7 | 505.6 | 33.4 |
| Stone | 6,492.4 | 20.3 | 122.5 | 8.1 |
| Worm rail | 5,777.5 | 18.1 | 109.0 | 7.2 |
| Board | 3,067.3 | 9.6 | 57.9 | 3.8 |
| Straight rail | 2,903.1 | 9.1 | 54.8 | 3.6 |
| Brush | 1,990.0 | 6.2 | 37.5 | 2.9 |
| Smooth wire | 1,615.2 | 5.0 | 30.5 | 2.0 |
| Railroad-owned (all woven wire) | 772.3 | 2.4 | 14.6 | 1.0 |
| Hedge | 711.8 | 2.2 | 13.4 | 0.9 |
| Stone pile | 583.3 | 1.8 | 11.0 | 0.7 |
| Stump | 526.1 | 1.6 | 9.9 | 0.7 |
| Picket | 436.7 | 1.4 | 8.2 | 0.5 |
| Barn | 279.0 | 0.9 | 5.3 | 0.3 |
| Total | 80,307.2 | 250.9 | 1,515.2 | 100.0 |

It is difficult to define a fence. In table 11, any well-defined barrier to cultivation between crop fields, and all pasture fences in use, are considered to be fences. This explains the inclusion of stone-pile and brush fences as separate classes in the table. They waste land, but will not turn stock. On the other hand, many wire fences will not turn stock. In general, the more land a fence wastes, the less efficient it is in performing the most important function of a fence.

Woven wire and barbed wire are the most important fencing materials used on New York farms, as shown in table 11. Together they constitute more than two-thirds of the fences found on these farms. They are practically the only kinds of fence being built under present conditions, and hence they will become more important as they replace other types. On these farms a little more woven-wire than barbed-wire fence was found. Stone

fences were important in the southeastern and western parts of the State, but made up only eight per cent of the total fence. Virginia, or worm rail, fences are still found on many farms. These and other wooden fences have survived from earlier days when lumber was cheap. They are too expensive to build and maintain under present conditions, and are rapidly being replaced by wire fences. Board fences will continue to be used to some extent as barnyard fences to shelter stock from winds.

*Relation of type of farming to fencing practice*

The relative importance of different types of fencing varies widely in different parts of the State. This is to be expected, since the respective localities shown in table 12 represent distinct types of farming, with different fence requirements.

TABLE 12. IMPORTANT KINDS OF FENCING IN DIFFERENT REGIONS OF NEW YORK

| Western New York 24 farms | | Southern New York 11 farms | | Southeastern New York 4 farms | | Central New York 12 farms | |
|---|---|---|---|---|---|---|---|
| Kind of fence | Per cent of total fencing | Kind of fence | Per cent of total fencing | Kind of fence | Per cent of total fencing | Kind of fence | Per cent of total fencing |
| Woven wire | 55.1 | Barbed wire | 64.8 | Barbed wire | 52.0 | Barbed wire | 37.2 |
| Barbed wire | 11.1 | Board | 8.9 | Stone | 35.7 | Woven wire | 36.5 |
| Worm rail | 10.0 | Woven wire | 8.5 | Straight rail | 4.5 | Worm rail | 5.3 |
| Stone | 8.3 | Worm rail | 6.0 | Board | 3.8 | Board | 4.2 |
| Straight rail | 5.5 | Stone | 3.1 | Worm rail | 1.5 | Straight rail | 3.6 |
| Hedge | 2.2 | Smooth wire | 1.4 | Smooth wire | 0.6 | Stone | 3.4 |

*Western New York*

The twenty-four farms included in the western New York group are located in the counties of Erie, Genesee, Livingston, Monroe, Niagara, Ontario, Orleans, Seneca, and Yates. On these farms more than half of the fencing was of woven wire, while barbed wire formed but 11 per cent of the total. Worm rail, stone, straight rail, and hedge follow next, in order of use. These types are relics of earlier times, and all except the stone are rapidly disappearing.

The farms in this group are largely devoted to fruit and general farm crops. The farms averaged 128.6 acres, of which 97.1 acres were in crops. They had an average of five cattle units and 16 acres of permanent pasture per farm. Only two of the farms had more than six cows. On three farms a few sheep were kept. Land in this region is relatively high-priced, these farms averaging $120 an acre. Under such conditions, the experience of these farmers indicates that woven wire is the most desirable kind of fence. The small areas of permanent pasture are usually pastured by the family cow and the horses, with occasionally a few sheep. Barbed wire is too dangerous where horses form a considerable proportion of the stock pastured, and it will not restrain sheep. In answer to the question "What kind of fence do you consider best for your conditions?" all the farmers except one in this region expressed a preference for woven wire with one strand of barbed wire on the top. The single exception was the owner of a farm with no pasture, who preferred no fence at all.

Perhaps even more reliable than these answers as an indication of the most desirable fence for western New York conditions is the record of fence purchases. Cost accounts on these farms for the years 1914 to 1917, show that a total of 1070 rods of woven wire fencing have been bought and but 1314 rods of barbed wire. This amount of barbed wire is little more than enough to furnish a single strand of barbed wire to put above the woven wire.

*Southern New York*

The eleven southern New York farms are located in the counties of Cattaraugus, Chemung, Wyoming, and southern Cortland. Barbed wire constitutes about two-thirds of the fence on the farms studied in this region, with smaller amounts of board, woven wire, worm rail, stone, and smooth wire. As in other regions, the board and worm-rail fences are fast being supplanted by wire fencing.

These farms averaged 166 acres each, of which 101.6 acres were in crops and 49.6 acres in permanent pasture. They had an average of 22.1 cattle units to each farm, and all but two of the farms had more than six cows. Land in this region is relatively cheap, these farms averaging $67 an acre. Under these conditions barbed wire has been proved by experience to be the most desirable fence, considering all factors. The typical fence in this region is of three- or four-strand barbed wire. Where large areas of

cheap pasture land are to be inclosed, this in undoubtedly the cheapest fence that will satisfactorily turn stock. The principal stock pastured is cattle. As the number of horses pastured is comparatively small, the danger of injury to stock by barbed wire is not great enough to justify inclosing the large areas of pasture by a more expensive fence, such as woven wire. Again, it is difficult to stretch woven wire where the topography is as rolling as it is in most of this region.

All except two of the farmers in this group believed barbed wire to be the best fence for their conditions, considering all factors. These two expressed a preference for woven wire because of danger of injury to stock by barbed wire. The typical fence favored by most of these farmers was a four-strand barbed wire, stretched tight, with chestnut posts The cost accounts on these farms show that a total of 1913 rods of barbed wire was purchased during the years 1914 to 1917, as against 140 rods of woven wire. This would indicate that nearly four rods of barbed wire fence are being built on these farms to one rod of woven wire.

*Southeastern New York*

There were only four farms studied in southeastern New York, all of these being located in Orange County. Barbed wire leads in the kinds of fence found on these farms, constituting more than half of the total fencing. Stone fence forms more than a third of the total, and the small remainder is made up of straight rail, board, worm rail, and smooth wire. Less wooden fence is found in this section of the State than in other sections. This is to be expected, since this region was settled first and practically all of the wooden fence materials have now disappeared.

The four farms in this region averaged 135.1 acres each, of which 72.3 acres were in crops and 52.6 acres were in permanent pasture. They had an average of 22.4 cattle units to each farm, being intensive dairy farms with one exception. Land in this region is relatively cheap. Under these conditions, barbed wire has been found to be the most satisfactory fence, utility and price considered. The typical fence in this region is three-strand barbed wire with more or less stone along the bottom. The same conditions that make barbed wire the most desirable fence in southern New York obtain in this region — large areas of cheap pasture land, uneven topography, and cattle the principal stock pastured. Four-strand barbed wire, stretched tight, with chestnut or oak posts, was considered by these

dairymen to be the best fence for their conditions. Cost accounts on these farms show that 1544 rods of barbed wire have been purchased during the years 1914 to 1917, as against 30 rods of woven wire.

*Central New York*

The twelve farms included in the central New York group are located in the counties of Cayuga, Onondaga, Oswego, and Tompkins. On the farms studied in this region, barbed wire and woven wire fences are of equal importance, each constituting a little more than a third of the total fence. Worm rail, board, straight rail, and stone are found in small amounts.

These farms averaged 275 acres each, of which 156.3 acres were in crops and 99 acres were in permanent pasture. They had an average of 31.3 cattle units to each farm, and all farms except one had more than six cows. Land is neither as cheap as in southern New York nor as high as in western New York, averaging $74 an acre on the farms studied. The average size of these farms was much larger than that of the farms in other regions, due to the inclusion of four unusually large farms. This region represents conditions intermediate between those of southern and those of western New York, and it is but natural that fencing practice should likewise be intermediate. On six of the twelve farms, woven wire was used the most for fencing. All except one of these were dairy farms, but they grew large areas of general crops as well. On the other six farms, barbed wire was used the most for fencing. These were all more intensive dairy farms. They had about the same area of pasture and the same number of cows, but land was cheaper, averaging $54 an acre as against $90 an acre for the six farms having a larger proportion of woven wire. The determining factor seemed to be the value of the land. In New York cheap land is usually fenced with a cheap fence, barbed wire, while good land justifies the best fence, woven wire. Little barbed wire fencing is found on New York farm land worth $100 or more an acre.

*Distribution of fence on farms*

The division of farm fences into four general classes with reference to their location on the farm, is shown in table 13. Practically no temporary interior fences were found on the farms studied, and so this classification is omitted.

TABLE 13. RELATION OF SIZE OF FARMS TO DISTRIBUTION OF FENCE

| Size of farms (acres) | Number of farms | Road fence (per cent) | Boundary fence (per cent) | Interior fence (per cent) | Farmstead fence (per cent) |
|---|---|---|---|---|---|
| Less than 100 | 13 | 9 | 46 | 43 | 2 |
| 100–159.9 | 18 | 12 | 41 | 45 | 2 |
| 160–239.9 | 15 | 15 | 38 | 46 | 1 |
| 240 or more | 7 | 16 | 35 | 48 | 1 |
| Total | 53 | ..... | ..... | ..... | ..... |
| Average | ..... | 13 | 39 | 46 | 2 |

Not all of the roadside or the boundary lines or the field division lines of farms are fenced. The figures given in table 13 are concerned only with fenced farm divisions. In table 14 is shown the distribution of all farm division lines, both fenced and unfenced, and how the distribution is affected by the size of the farm.

TABLE 14. RELATION OF SIZE OF FARMS TO DISTRIBUTION OF FARM DIVISION LINES

| Size of farms (acres) | Number of farms | Farm roadsides (per cent) | Farm boundary lines (per cent) | Interior field division lines (per cent) | Farmstead division lines (per cent) |
|---|---|---|---|---|---|
| Less than 100 | 13 | 11 | 36 | 51 | 2 |
| 100–159.9 | 18 | 15 | 33 | 50 | 1 |
| 160–239.9 | 15 | 17 | 32 | 50 | 1 |
| 240 or more | 7 | 19 | 33 | 47 | 1 |
| Total | 53 | ..... | ..... | ..... | ..... |
| Average | ..... | 16 | 33 | 50 | 1 |

The relation of size of farms to the proportion of farm division lines fenced is shown in table 15. The larger farms were more completely fenced, 84 per cent of all farm divisions of the largest farms being fenced as compared with only 65 per cent for the smallest farms. Nearly as large

TABLE 15. RELATION OF SIZE OF FARMS TO PROPORTION OF FARM DIVISION LINES FENCED

| Size of farms (acres) | Number of farms | Per cent fenced | | | | |
|---|---|---|---|---|---|---|
| | | Roadsides | Boundary lines | Interior field division lines | Farmstead division lines | Total farm division lines |
| Less than 100 | 13 | 52 | 82 | 55 | 78 | 65 |
| 100–159.9 | 18 | 53 | 84 | 61 | 88 | 68 |
| 160–239.9 | 15 | 64 | 91 | 70 | 88 | 76 |
| 240 or more | 7 | 72 | 89 | 85 | 75 | 84 |
| Total | 53 | ..... | ..... | ..... | ..... | ..... |
| Average | ..... | 62 | 87 | 69 | 83 | 74 |

a proportion of the farm boundary lines of small farms were fenced as of the large farms, but a much smaller proportion of the roadsides and the interior field division lines.

### *Economy of fencing*

The relation of size of farms to economy of fencing is shown in table 16. In comparing the rods of fence to the acre on these farms as shown by the "Fenced" columns in the table, it should be remembered that the larger farms are more completely fenced. The "Total" columns in table 16 show the economy that would obtain with larger farms if all

TABLE 16. RELATION OF SIZE OF FARMS TO ECONOMY OF FENCING

| Size of farms (acres) | Number of farms | Rods per acre | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Farm roadsides | | Farm boundary lines | | Interior field division lines | | Farmstead division lines | | Total farm division lines | |
| | | Total | Fenced | Total | Fenced | Total | Fenced | Total | Fenced | Total | Fenced |
| Less than 100 | 13 | 1.9 | 1.0 | 6.1 | 5.0 | 8.6 | 4.8 | 0.3 | 0.3 | 17.0 | 11.0 |
| 100–159.9 | 18 | 2.0 | 1.1 | 4.5 | 3.8 | 6.8 | 4.2 | 0.2 | 0.2 | 13.6 | 9.2 |
| 160–239.9 | 15 | 2.1 | 1.4 | 3.8 | 3.4 | 6.0 | 4.2 | 0.1 | 0.1 | 12.0 | 9.1 |
| 240 or more | 7 | 1.6 | 1.2 | 2.9 | 2.6 | 4.1 | 3.5 | 0.1 | 0.1 | 8.7 | 7.3 |
| Total | 53 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Average | ..... | 1.9 | 1.2 | 3.9 | 3.4 | 5.8 | 4.0 | 0.2 | 0.1 | 11.8 | 8.7 |

farm division lines were fenced. If all farm division lines on these farms were fenced, 17 rods of fence to an acre would be required on the smallest farms, but only 8.7 rods to an acre on the largest farms.

*Land occupied by fences*

A considerable area of crop land is made untillable by fences. On the fifty-three farms included in these studies, the total area of general crop

Fig. 119. A STONE ROW THAT FUNCTIONS AS A FENCE ONLY IN WASTING LAND AND IN FORMING A BARRIER TO CULTIVATION

This stone row occupies a strip of land 20 feet wide. Land here is worth $100 an acre

land thus made untillable amounted to 101.8 acres. Part of this is necessary and unavoidable, but a considerable proportion is neither necessary nor desirable under present conditions (figs. 119 and 120). The proportion of the land occupied by fences depends on the size of the farm, the size of the crop fields, the kind of fence, and the crops grown. While the large farms, among those studied, were more completely fenced, a smaller proportion of their area was occupied by fences, as is shown in table 17.

The data given in table 18 relate to the land made untillable by fences around crop fields. Fences between pasture fields or orchards occupy

TABLE 17. RELATION OF SIZE OF FARMS TO CROP LAND OCCUPIED BY FENCES

| Size of farms (acres) | Number of farms | Average size of farms (acres) | Crop land occupied by fences | | |
|---|---|---|---|---|---|
| | | | Per farm (acres) | Per cent of farm area | Per cent of crop land other than fruit |
| Less than 100 | 13 | 76.2 | 1.08 | 1.4 | 2.5 |
| 100–174 9 | 20 | 127.4 | 1.45 | 1.1 | 1.8 |
| 175 or more | 20 | 282.6 | 2.92 | 1.0 | 1.8 |
| Total | 53 | ..... | ..... | ..... | ..... |
| Average | ..... | 173.4 | 1.92 | 1.1 | 1.8 |

FIG. 120. A WOVEN WIRE FENCE BETWEEN TWO CORNFIELDS

Even under the most favorable conditions, fences make untillable a considerable strip of ground. This wire fence occupies a strip of land 6 feet wide

practically no land; but with a fence separating two general crop fields, the width of the strip of land made untillable, as shown by table 18, would be doubled, and the number of rods of fence required to waste one acre of land would be one-half of that given in the table.

TABLE 18. RELATION OF KIND OF FENCE AND CROP TO LAND OCCUPIED BY FENCES

| Kind of fence | Width of land made untillable, in feet (one side of fence only) | | | | Rods of fence necessary to occupy one acre | Value of land occupied by each rod of fence, at $100 an acre |
|---|---|---|---|---|---|---|
| | Hay | Small grain | Cultivated crop | Average | | |
| Smooth wire | 2.3 | 3.0 | 3.8 | 3.0 | 871 | $0.115 |
| Smooth wire and stone | 6.1 | 7.2 | 7.7 | 7.0 | 377 | 0.265 |
| Board fence | 2.6 | 3.1 | 3.4 | 3.0 | 871 | 0.115 |
| Board fence and stone | 6.0 | 5.0 | 7.2 | 6.1 | 435 | 0.230 |
| Woven wire | 2.6 | 3.3 | 3.4 | 3.1 | 852 | 0.117 |
| Woven wire and stone | 5.3 | 6.6 | 7.0 | 6.3 | 419 | 0.239 |
| Barbed wire | 2.9 | 3.4 | 3.7 | 3.3 | 793 | 0.126 |
| Barbed wire and stone | 5.9 | 8.4 | 7.6 | 7.3 | 362 | 0.276 |
| Straight rail | 3.4 | 3.5 | 3.9 | 3.6 | 733 | 0.136 |
| Straight rail and stone | 5.5 | 7.4 | 9.0 | 7.3 | 362 | 0.276 |
| Laid stone fence | 4.4 | 4.8 | 5.5 | 4.9 | 539 | 0.186 |
| Laid stone fence and stone | 8.5 | 11.8 | 12.3 | 10.9 | 243 | 0.411 |
| Stone pile | 5.7 | 6.0 | 6.1 | 5.9 | 445 | 0.225 |
| Stump | 5.4 | 5.8 | 7.0 | 6.1 | 435 | 0.230 |
| Worm rail | 5.6 | 6.1 | 7.6 | 6.4 | 411 | 0.243 |
| Worm rail and stone | 8.4 | 8.8 | 11.7 | 9.6 | 274 | 0.365 |
| Brush | 9.4 | 11.7 | 7.0 | 9.4 | 282 | 0.355 |
| Hedge | 7.7 | 10.6 | 10.4 | 9.6 | 276 | 0.362 |

With any fence, the width of land made untillable is least when the field is in hay and greatest when the field is in a cultivated crop. This is to be expected, since it is possible to get closer to the fence with a mower than with other tools. When small grains are grown, the width of the strip of waste land is greater than when hay is grown but less than when a cultivated crop is grown. The differences are not important but they are perceptible.

The width of waste land along many fences is increased by the accumulation of stones that have been taken from the field and thrown along the fence. Even a few stones along a fence are enough to double the necessary waste. The stones that project farthest out into the field determine the width of waste along the entire side of a field. These results show that the presence of stone along a fence approximately doubles the width of the strip of land occupied.

Smooth wire, board, and woven wire fences occupied the least land on these farms (fig. 121). Smooth wire will not turn stock satisfactorily and board fence is obsolete. Woven wire stretched tight with a strand of barbed wire on top turns stock satisfactorily without danger of injury and occupies little land. Putting a strand of barbed wire above woven wire fence has become an almost universal practice on New York farms. Without any danger of injuring stock, it prevents stock from crowding down the fence and thereby ruining it.

Barbed wire and straight rail fences waste slightly more land than does woven wire. It is impossible to cultivate as close to barbed wire as to

Fig. 121. Two sides of a woven wire fence

On the left the brush is cut and the fence occupies but two feet of land. On the right the brush and the fence occupy a strip of land 6 feet wide

woven wire, because of danger of injury to horses. Straight rail fence would be too expensive to build new, but it furnishes a satisfactory way of using old but sound fence rails. Barbed wire is the cheapest satisfactory fence for inclosing large areas of cheap cattle pasture.

Stone fences are wider than wire fences and necessarily occupy more land. Stone-pile fence does not really deserve the name of fence. It functions as a fence only in being a barrier to cultivation and in wasting land. In early times stone fences furnished a satisfactory way of getting rid of surplus stones; in the present day they are serious barriers to the enlargement of fields, because of the expense of removing them. Good use has been made of some stone fences in the improvement of roads. Many

one fences, particularly in the southeastern part of the State, are so wide ıd so high that the saving thru larger fields would not justify their removal nless the stones could be used for some such purpose.

Stump and worm rail fences waste much land, harbor weeds and woodıucks, and do not turn stock satisfactorily. Unless land is very cheap , will usually pay to replace such fences with wire.

Brush and hedge fences (figs. 122 and 123) are the most wasteful of ınd of all fences found on the farms studied. Neither of these fences

Fig. 122. An untrimmed hedge occupying a strip of land 3 rods wide where land is worth $150 an acre

Every rod of this fence occupies nearly $3 worth of land. The cost of clearing 60 rods of similar hedge on this farm was 80 cents a rod

has a place on any New York farm, but unfortunately both are expensive to eradicate. Hedge fences are expensive to trim, but more expensive to let go. They waste much land, harbor insect pests and woodchucks, and do not turn stock satisfactorily. On land worth $100 an acre, the land actually occupied on both sides of an average hedge fence would be worth 72 cents a rod. In addition to the land actually occupied, hedge fences injure the crop for a considerable distance on each side.

Fig. 123. A closely trimmed hedge

Even closely trimmed hedges occupy a wide strip of land. This hedge actually makes untillable a strip of land 10 feet wide and injures the crop for some distance beyond this

### *Proportion of farm area in fenced fields*

The proportion of farm area in fenced fields on the fifty-three farms included in this study, in its relation to the size of the farms, is given in table 19. This table shows a smaller proportion of crop area and of total farm area in fenced fields on the smaller farms than on the larger ones. The group of small farms includes a larger proportion of fruit and crop farms

TABLE 19. Relation of Size of Farms to Proportion of Farm Area in Fenced Fields

| Size of farms (acres) | Number of farms | Average size of farms (acres) | Per cent of area in fenced fields | | | |
|---|---|---|---|---|---|---|
| | | | Crop land | Pasture land | Woods not pastured | Total |
| Less than 100 | 13 | 76.2 | 26 | 100 | 42 | 39 |
| 100–174.9 | 20 | 127.4 | 34 | 100 | 38 | 48 |
| 175 or more | 20 | 282.6 | 47 | 100 | 16 | 64 |
| Total | 53 | ..... | ..... | ..... | ..... | ..... |
| Average | ..... | 173.4 | 40 | 100 | 23 | 57 |

on which little stock is kept. On such farms fenced fields are often unnecessary and undesirable. The proportion of crop and farm area in fenced fields in its relation to the number of acres to each cow, is as shown in table 20:

TABLE 20. Relation of Number of Acres to Each Cow to Proportion of Crop and Farm Area in Fenced Fields

| Number of acres to each cow | Number of farms | Average number of acres to each cow | Average size of farms (acres) | Average number of cows to the farm | Per cent of area in fenced fields | |
|---|---|---|---|---|---|---|
| | | | | | Crop land | Farm area |
| 20 or more | 20 | 40.4 | 113.1 | 2.8 | 26 | 31 |
| 10–19 | 12 | 14.7 | 277 6 | 18.9 | 40 | 63 |
| Less than 10 | 16 | 7.1 | 165 9 | 23.5 | 42 | 63 |
| Total | *48 | ..... | ..... | ..... | ..... | ..... |
| Average | ..... | 12.5 | 171.8 | 13.7 | 36 | 54 |

* In this tabulation five farms were omitted because some sheep were kept in addition to the cows.

*Relative advantages and disadvantages of fenced and unfenced crop fields*

The question of fencing crop fields is one of considerable importance to farmers. There are many advantages and likewise many disadvantages in this practice. If fields are fenced, the stock can be pastured earlier in the spring and later in the fall than is otherwise possible, as well as in midsummer when permanent pastures are poor. Pasture is of the most value at these times, because it takes the place of barn feed. Cornfields can be pastured after the corn has been put into the silo; the scattered ears and stalks furnish a considerable amount of valuable feed. If seeding is done with wheat, the oat stubble may be pastured. Even in a stubble field the grass in the fence rows furnishes some feed, while the pasturing saves mowing by hand. Old meadows can be pastured in the fall and spring before they are plowed for corn. Aftermath in meadows is frequently pastured. It furnishes feed when permanent pastures are usually poor.

The disadvantages of fencing crop fields are also numerous. Fences prevent the adjustment of field lines to changed conditions. In going to

a fenced field, it is necessary to go around to the gate. When fields are fenced there is a tendency to turn stock on them at times when the crops and the land will be injured. Fence lines occupy a considerable area of land (figs. 124 and 125). In addition to the land that is left untilled, there is a waste in the crops that are injured along a fence by turning. The actual loss by fences is probably double the figures given in table 18 (page 469). The cost of maintaining fences is an important item and it is rapidly be-

Fig. 124. UNNECESSARY WASTE OF LAND BY FENCING

Every rod of this fence wastes land worth $1, besides furnishing an ideal protection for weeds, brush, and woodchucks. Field fences are unnecessary in this region since little stock is kept

coming more important. The actual cost of maintenance varies with the type of fence. It was probably between 5 and 10 cents a rod a year on most farms in 1919, when this study was made. In unfenced fields the aftermath and stubble not pastured are not entirely wasted if left on the land, as they serve as green manure and help to keep up the supply of humus.

The value of the feed from meadows depends on the cost of the feed which it replaces. If it replaces pasture, its value is approximately equal to the cost of pasture, usually about $1 to $2 a month for each cow. If

it replaces barn feed its value is approximately the cost of barn feed, which is very much higher than the cost of pasture.

Cost accounts were kept in 1916 and 1917 on forty of the farms included in these studies. On twenty of these the meadows were pastured to a greater or less extent. On eighteen farms of twenty-six which had ten or more units of stock other than horses to pasture, the permanent pasture was supplemented by pasturing meadows; of the other eight, one could

Fig. 125. UNFENCED FIELD LINES WHICH OCCUPY NO LAND AND DO NOT INTERFERE WITH CULTIVATION

On this farm little stock is kept and fenced crop fields are both unnecessary and undesirable

not pasture meadows because the soil was too sandy to hold grass well, and three had large areas of very cheap permanent pasture but little crop land. The farmers who pastured their meadows secured an average amount of pasture equivalent to the pasture of twenty-one cows for one month. This was equivalent to about one-fifth of the total pasture on these farms. The extra fence necessary for the fenced crop fields on these farms, in addition to permanent pasture, boundary, and lane fence, averaged 285 rods for each farm. At 6 cents a rod the cost of maintaining this extra fence would be $17.10 a year.

*Gates*

Gates should be placed where they will give the most convenient access to fields; usually this means as close to the corner of the field nearest the buildings as the nature of the ground will permit. Where a gate is inconveniently located, time or crops or both are wasted. On one of the farms studied, the gate to a 10-acre crop field fronting on the road was in the corner of the fence farthest from the buildings. This location made the distance from the barn to the field 27 rods longer, and every round trip to the field 54 rods longer, than if the gate had been in the nearest corner. With an average of six man trips and fourteen horse trips an acre in a year, about ten man miles and twenty-four horse miles of unnecessary travel each year is required to farm this field with the present arrangement.

The location of the gate is far more important than its construction. Farmstead gates which are opened and closed many times daily should be hinged so as to swing easily. Gates that swing both ways are preferable for such conditions. The weakest point in such gates, however, is the hinge, and therefore field gates are seldom hinged. The typical farm gate is the ordinary slide gate made of boards. This is easily built, cheap, and substantial.

*Cost of fence maintenance*

The combination of the data obtained in these studies with the cost-accounting records kept by the farmers made it possible to compute the actual cost of upkeep of the fences on these farms. The records for 1914, 1915, 1916, and 1917 were used, and all the farms were included each year for which sufficient data were available. A total of 105 records were obtained, representing forty-one farms. The data are given in tables 21 and 22.

The cost of work done in repairing and improving farm fences was obtained from the cost accounts. The actual hours of labor were taken from the work reports kept by farmers, and the cost per hour of man and horse labor is the actual farm cost for that year. Both labor and other costs of building new fence are included as upkeep costs, since with a number of farms it is a safe assumption that the new fence built in any year will approximately represent the normal necessary replacement. The labor data for mowing fence rows were obtained partly from the cost accounts and partly by estimates of the farmers. The cost per hour was taken from the cost accounts in each case. The amounts and cost of fencing, gates, posts, and other materials purchased, were taken from the

ost accounts in each case. The amount of crop land occupied by fences vas obtained from the data given in these studies. The value of the land ccupied by fences was determined for each farm from the area of land ctually occupied and the value of this land as given in the accounts. Rental at 5 per cent on the value of land occupied was included as part of he cost of maintaining fences. The number of posts cut from farm wood-ots, and their value before cutting, were obtained from estimates by the armers. The labor of getting out and splitting posts is included in the her labor on fences.

In computing the amount of fence maintained to each farm, it has been assumed that each farmer maintains half of the boundary fence of his farm. While not always true in individual cases, this should closely approximate the truth for a group of farms. All fences maintained by railroads, highway fences maintained by the State, and stone-pile and brush fences, were deducted in determining the amount of fence maintained to each farm. The present farm value of each kind of fence was determined from estimates by the farmers. Interest at 5 per cent on the present value of fences was included as one of the costs of maintaining them.

TABLE 21. KINDS, AMOUNTS, AND FARM VALUES OF FENCING MAINTAINED FOR WHICH THE COST OF MAINTENANCE WAS DETERMINED

| Kind of fence | Total of 105 farm records | | Per farm record | | Average value per rod of fence |
|---|---|---|---|---|---|
| | Rods | Value | Rods | Value | |
| Woven wire | 40,790 | $18,422.21 | 388.5 | $175.45 | $0.45 |
| Barbed wire | 45,896 | 11,288.81 | 437.1 | 107.51 | 0.25 |
| Stone | 8,773 | 1,553.75 | 83.6 | 14.80 | 0.18 |
| Worm rail | 8,719 | 1,646.19 | 83.0 | 15.68 | 0.19 |
| Board | 6,108 | 1,353.45 | 58.2 | 12.89 | 0.22 |
| Straight rail | 4,372 | 1,011.18 | 41.6 | 9.63 | 0.23 |
| Other kinds of fencing | 6,318 | 1,063.45 | 60.2 | 10.13 | 0.17 |
| Total | 120,976 | $36,339.04 | 1,152.2 | $346.09 | ..... |

As shown in table 21, the average amount of fencing maintained to each farm was 1152 rods, or 3.6 miles, valued at 30 cents a rod. The average farm value of the fences in their present condition was $346.09 a farm, or about $2 an acre.

TABLE 22. COST OF MAINTAINING FARM FENCES ON FORTY-ONE NEW YORK FARMS FOR THE YEARS 1914 TO 1917, INCLUSIVE

(105 farm records, including 120,976 rods of fence)

| Item | Total of 105 farm records | | Per farm record | | Cost per rod of fence maintained |
|---|---|---|---|---|---|
| | Amount | Cost | Amount | Cost | |
| Labor: | | | | | |
| Fence repairs: | | | | | |
| Man labor | 7,414 hrs. | $1,305.33 | 70.6 hrs. | $12.43 | ..... |
| Horse labor | 2,536 hrs. | 396.36 | 24.2 hrs. | 3.77 | ..... |
| Equipment use | 2,536 hrs. | 115.65 | ..... | 1.10 | ..... |
| Total | ..... | $1,817.34 | ..... | $17.31 | $0.015 |
| New fence: | | | | | |
| Man labor | 2,188 hrs. | $439.55 | 20.8 hrs. | $4.19 | ..... |
| Horse labor | 743 hrs. | 132.58 | 7.1 hrs. | 1.26 | ..... |
| Equipment use | 743 hrs. | 36.28 | ..... | 0.34 | ..... |
| Total | ..... | $608.41 | ..... | $5.79 | $0.005 |
| Mowing fence rows: | | | | | |
| Man labor | 2,405 hrs. | $444.91 | 22.9 hrs. | $4.24 | ..... |
| Horse labor | 190 hrs. | 28.20 | 1.8 hrs. | 0.27 | ..... |
| Equipment use | 190 hrs. | 9.60 | ..... | 0.09 | ..... |
| Total | ..... | $482.71 | ..... | $4.60 | $0.001 |
| Total labor cost | ..... | $2,908.46 | ..... | $27.70 | $0.024 |
| Materials purchased: | | | | | |
| Fence posts | 1,891 | $246.17 | 18.0 | $2.34 | $0.002 |
| Woven wire | 1,695 rods | 540.22 | 16.1 rods | 5.14 | 0.004 |
| Barbed wire | 6,612 lbs. | 253.33 | 63.0 lbs. | 2.41 | 0.002 |
| Other wire | 386 lbs. | 14.38 | 3.7 lbs. | 0.14 | 0.0001 |
| Staples | 614 lbs. | 29.75 | 5.8 lbs. | 0.28 | 0.0002 |
| Lumber for gates | ..... | 47.60 | ..... | 0.45 | 0.0004 |
| Total cost of materials | ..... | $1,131.45 | ..... | $10.77 | $0.009 |
| Other costs: | | | | | |
| Rental at 5 per cent on value of land occupied by fences | ..... | $ 681.01 | ..... | $ 6.49 | $0.006 |
| Value, before cutting, of posts cut from farm woodlots | 6,455 posts | 385.98 | 61.5 posts | 3.68 | 0.003 |
| Interest at 5 per cent on present farm value of fence maintained | ..... | 1,816.87 | ..... | 17.30 | 0.015 |
| Total of other costs | ..... | $2,883.86 | ..... | $27.47 | $0.024 |
| Entire total cost | ..... | $6,923.77 | ..... | $65.94 | $0.057 |

The average cost of maintaining fences on these farms for the four years was 5.7 cents a rod. With 1919 prices this cost would be about doubled. The average costs by years for these farms are as follows:

| | |
|---|---|
| 23 farms, 1914 | 5.8 cents a rod |
| 33 farms, 1915 | 5.7 cents a rod |
| 26 farms, 1916 | 5.5 cents a rod |
| 23 farms, 1917 | 5.9 cents a rod |
| 105 farm records, four years | 5.7 cents a rod |

The variation on individual farms ranged from 2 to 12 cents a rod. Farm costs for any one year are greatly affected by the amount of fencing done in that year, but with a group of farms this factor is stabilized.

The cost by the rod of maintaining fence depends on the kind of fence. On fifteen farms having 75 per cent of barbed wire fence and only 7 per cent of woven wire, the average cost of maintaining fence was 4.9 cents a rod. On seventeen farms having 70 per cent of woven wire fence and only 4 per cent of barbed wire, the average cost was 6.8 cents a rod. On twenty-one farms having 26 per cent of woven wire fence and 28 per cent of barbed wire, the average cost was 5.5 cents.

Of the fences having posts, one post was used for every 12.3 rods of fence each year. Since posts are usually set about a rod apart, it appears that the posts last about twelve years.

### FARM LANES AND DRIVEWAYS

In this discussion the word *lane* designates a fenced private passageway which is primarily used to make pastures accessible to buildings. Altho used for other purposes also, lanes are arranged chiefly to save time in getting stock to and from pasture. They are therefore necessarily fenced. The word *driveway* is employed to designate the land primarily devoted to use as a passageway to crop fields. Driveways therefore need not be fenced. They may vary in location from year to year. Driveways are necessary on practically every farm, while lanes are not.

#### *Utility of lanes*

Whether or not lanes are needed, their width, and the area of land to be devoted to them, depend chiefly on the size of the farm, the shape of the farm, the area of crop land, the value of the farm land, and the amount of stock kept.

On the farms included in this study, 51.5 acres of land were devoted to farm lanes and driveways, or slightly less than an acre to each farm. Of this area 24.8 acres were in lanes which were pastured by stock, 13.1 acres were in fenced driveways not pastured, and 13.6 acres were in unfenced driveways. The average width of lanes pastured was 39 feet, of fenced driveways 25 feet, and of unfenced driveways 11 feet. The fenced driveways were formerly used as lanes for stock. Since they are no longer necessary for this purpose, they waste a considerable area of land. Assuming the width of the unfenced driveways given above (11 feet) as necessary, the fenced driveways waste about 8 acres of land. Most of this could be reclaimed for crops at a reasonable cost.

The larger farms included in this study had a smaller proportion of their area in lanes and driveways than the smaller farms. The farms of less than 100 acres had 0.9 per cent of the farm area in lanes and driveways, while on farms of more than 175 acres 0.4 per cent of the farm area was used in this way. The corresponding proportions of the crop area were 1.2 per cent and 0.7 per cent, respectively.

The shape of the farm is usually of more importance than its size in its effect on the proportion of the farm area necessary for lanes and driveways. Long, narrow farms, in addition to their other disadvantages, require much larger proportions of their areas for this use. On one farm a part only 440 feet wide had a necessary driveway 16 feet wide thruout most of its length. As far back as the driveway extended it occupied about 4 per cent of the crop land. This is in a region where land is worth about $150 an acre. The plan of this farm is shown in figure 99 (page 439). The long, narrow farm shown in figure 96 (page 436) has 1.6 per cent of its area in lanes and driveways. Striking contrasts in this respect are presented in figures 105 (page 445) and 109 (page 449). The elongated farm has 1 per cent of its area in lanes and driveways, while the compact farm of the same size has only one-seventh as much land devoted to this purpose.

The necessity for farm driveways depends somewhat also on the arrangement of public roads. Farms which are so divided by public roads that the fields are readily accessible, often need but few private driveways. However, public roads do not take the place of lanes for stock.

The question as to whether or not a lane would be advantageous on a given farm depends on its cost and on the saving in labor that it would effect. If much stock is kept and the pasture is not adjacent to the buildings, a lane would usually be justifiable. Part of the layout of a farm of 368 acres is shown in figure 126. On this farm a lane connects the barns with the night pasture, but the cows are driven up the road to the day pasture. The distance from the barnyard gate to the gate of the day pasture is 148 rods. Two round trips must be made daily with the fifty cows kept on this farm, taking the cows to pasture in the morning and going after them at night. This makes the distance traveled daily nearly two miles and the time consumed with a herd of this size an hour a day. The normal pasture season on this farm is about 150 days, and this means 150 hours spent in driving cows. This work comes during the crop-growing season, when time is most valuable. At 30 cents an hour the cost of driving cows would be $45 a year.

Fig. 126. Plan of a central New York dairy farm, showing the present route to the day pasture

Since there is no lane to this pasture, the herd of fifty cows must be driven up the highway to and from this field each day

A way in which this farm might be rearranged with a lane 4 rods wide running between fields A and B, con-

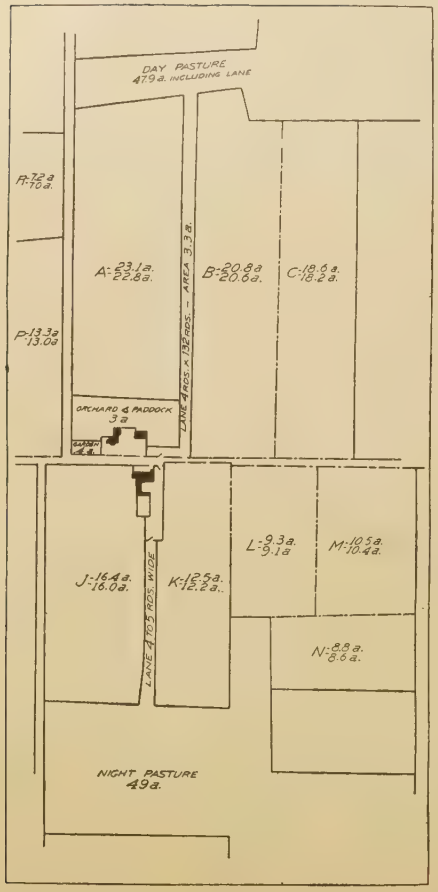


FIG. 127. PLAN OF THE FARM SHOWN IN FIGURE 126, ILLUSTRATING HOW A LANE COULD BE RUN FROM THE BARNYARD TO THE PASTURE, BETWEEN FIELDS A AND B

Such a lane would save much time, besides greatly lessening the danger of injury to the cattle by automobiles

necting the barnyard with the day pasture, is shown in figure 127. Some grain is fed to the cows all summer on this farm, and with such a lane very few trips would be required to get the cows.

A lane of this width would occupy 3.3 acres of crop land worth $60 an acre. Interest at 6 per cent on 3.3 acres of $60 land would amount to $11.88 a year. This land would not be wasted but would furnish considerable pasture. The length of good fence necessary for fencing this lane would be 264 rods. The dilapidated stone wall more than half a rod wide which separates fields A and B would not make a satisfactory lane fence, and therefore two new fences would be necessary. Since this lane would be used only by cattle, a four-strand barbed wire fence would be satisfactory. The annual cost of maintaining such a fence in 1918 would have been about $18. Using the figures given, the cost of land and fence for this lane would be about $30 a year. In this case a lane would effect a saving above

all costs of about $15 a year, besides furnishing some feed. It would also lessen danger of injury to cows by passing automobiles. If only one extra fence needed to be maintained, or if the pasture were used both night and day, the saving would be greater.

*Width of lanes*

Generally speaking, the width of a lane should be proportional to the number of cows using it. On the farms here under consideration, the average width of the lanes for herds of ten cows or less was 1.5 rods, for herds of from ten to twenty cows 2 rods, for herds of from twenty to thirty cows 3 rods, and for herds of more than thirty cows 4 rods. Wide lanes have many advantages. There is less danger of injury to cows thru crowding, and because of less crowding the cost of maintaining fences is less. Narrow lanes afford practically no feed at any time. In wet weather they are converted into mud holes, with the result that the cows come out with muddy legs and udders. Wide lanes preclude these disadvantages and furnish a considerable quantity of feed. They are substantially elongations of the pasture.

The proper width for a lane depends also on the character of the land, as well as on the number of cows using it. With wet land the lanes need to be wider in order to obviate mud holes. Under ordinary conditions the average widths given in the preceding paragraph should be satisfactory. The lane to the night pasture shown in figure 126 has good proportions for average soil conditions. It is used by fifty cows and varies from 4 to 5 rods in width.

In spite of the advantages of wide lanes it is not always advisable to have them. On long, narrow farms, a lane wide enough to furnish feed may take up too large a proportion of the tillable land. Under such a condition it may be better to waste land in a narrow lane than to make it wide enough to furnish pasture.

The location of most lanes is already fixed. New lanes should be so located that they run parallel to farm and field lines, in order not to make irregular fields. A poorly planned lane is shown in figure 128. Its direction was determined by the location of the buildings and the wet, untillable pasture at the back of the farm. Running the lane straight from the barns to this field, diagonal to the farm boundaries, made necessary many short rows on both sides. A peach orchard was planted with rows parallel to the lane, which made changing the lane difficult.

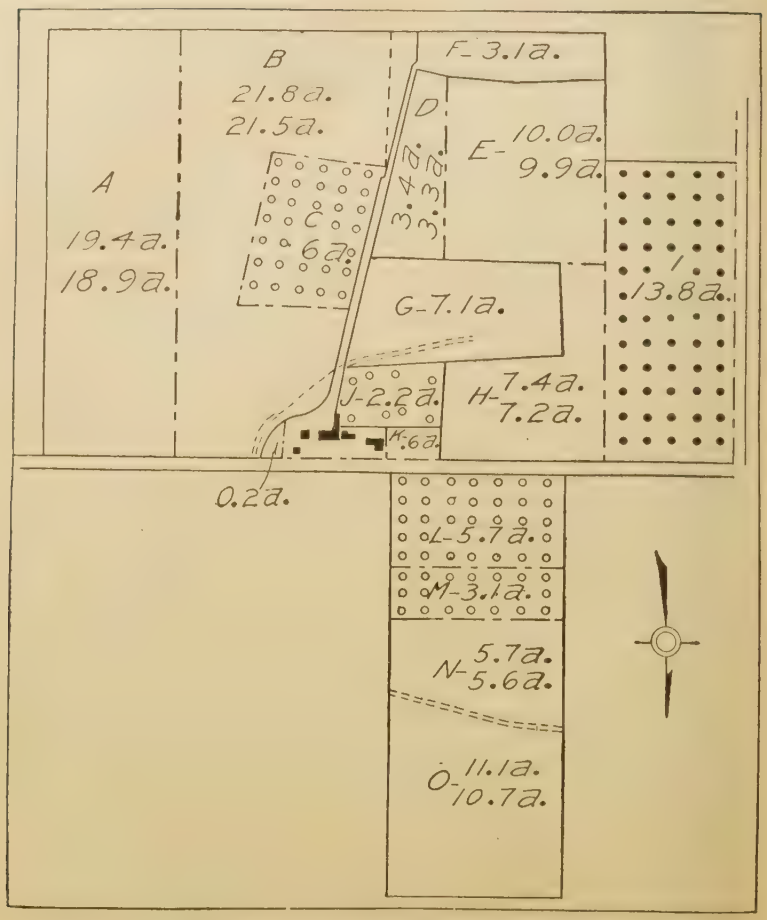


FIG. 128. FARM PLAN SHOWING A POORLY LAID OUT LANE

The lane was run from the buildings to the pasture at the back end of the farm, diagonal to the farm boundaries. A peach orchard was later planted, with its rows parallel to the lane, making it difficult to change the lane. The diagonal course of this lane necessitated short rows and was the cause of much wasted labor

This lack of foresight has already cost a considerable amount in farming unnecessary short rows.

On some farms with little stock, lanes are unnecessarily wide and thus waste valuable crop land. The plan of a western New York farm is

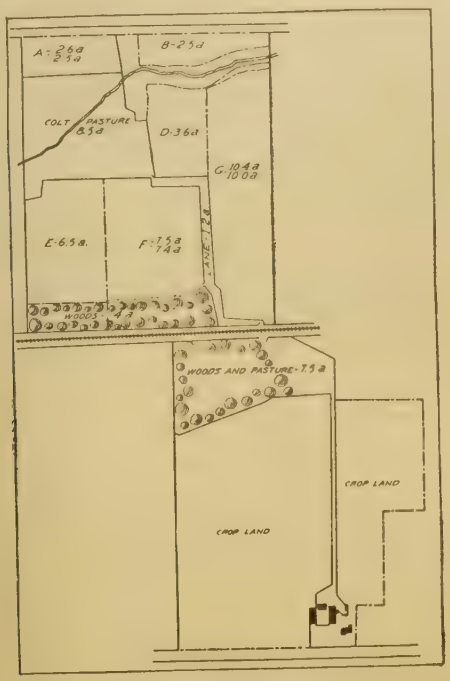


Fig. 129. Plan of a western New York fruit farm showing an unnecessary wide lane which occupies 1.2 acres of tillable land between fields F and G

shown in figure 129. The lane between fields F and G is between 3 and 4 rods wide and occupies 1.2 acres of crop land worth $125 an acre. This lane leads to a pasture in a creek bottom, used for pasturing colts and heifers. It is too distant from the barns to be used for pasturing other stock. Two cows are kept for home use. A lane leads from the barns

to the pasture used by the cows and the horses. A way in which the same farm could be rearranged with an unfenced driveway replacing the former wide lane is shown in figure 130. The wide lane is not needed for pasture. For the type of farming followed, there is ample pasture

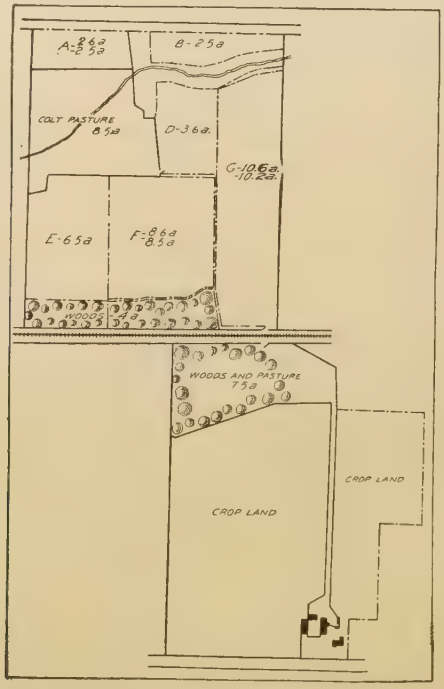


Fig. 130. Plan illustrating how the unnecessary lane shown in figure 129 could be eliminated, saving an acre of good land and the upkeep of 150 rods of fence

land which can be used for nothing else. The elimination of this lane would add about an acre of good land to the crop area and save the upkeep of 150 rods of fence. The saving would amount to about $15 or $20 a year.

Even if the advantages of a lane in this case were sufficient to pay the cost of fence upkeep, the lane is too wide for the amount of stock

kept. A lane of half this width would give ample room and save one-half of the land in the present lane. On a few farms having no permanent pasture, the lane is made wide enough to pasture the family cow until she can be turned out in the meadows, after haying.

### CROP LAND

Crop land is the highest grade of farm land. The area adapted to crop production is relatively more limited than the area adapted to pasture and forestry. Crop land produces a greater net value of product to the acre than do other farm lands, and is therefore more valuable. For these reasons, all the land that can be economically worked under conditions existing at a given time is usually cropped at that time. Changing agricultural conditions affect both the amount and the quality of crop land. The change from hand labor to machine methods of production has reduced considerable areas of land in New York from crop land to pasture, since land that was not adapted to the use of machinery could no longer be economically cultivated. The opening-up of the rich lands of the Middle West had a similar effect in reducing crop land to pasture.

There is a large amount of farm land in New York State which is adapted for use only as pasture. If, therefore, land that can be economically cropped is used as pasture land, it loses its advantage and competes directly with cheap land which is good only for pasture. For this reason, usually little stock is kept unless part of the land is suited only for pasture, and practically all of the land adapted to economic crop production is used for crops.

To be suitable for crop growing, land must be not only adapted to cultivation by machinery but also reasonably fertile. Not all the land suitable for crop growing can be cultivated economically, however. Some of it may be so far from the buildings, or in such small, irregular fields, that farming it does not pay. A large part of the tillable land now in permanent pasture is too far away to be worked to advantage by its present owners. Such land is frequently convenient to the farmstead of an adjoining farmer. Readjustments in ownership which would permit each farmer to work the land most convenient to his farmstead would increase the area of crop land as well as increase the efficiency of labor.

The utilization of land in cropped fields on the farms studied is shown in table 23:

TABLE 23. LAND IN CROPPED FIELDS ON 53 NEW YORK FARMS

| | Total number of acres | Number of acres per farm | Per cent of total farm area | Per cent of total area of cropped fields |
|---|---|---|---|---|
| Amount of land in cropped fields | 6,076.86 | 114.66 | 66.12 | 100.00 |
| Land in cropped fields not producing a crop: | | | | |
| Fence rows | 102.28 | 1.93 | 1.11 | 1.68 |
| Swampy land | 30.34 | 0.57 | 0.33 | 0.50 |
| Streams | 24.46 | 0.46 | 0.27 | 0.40 |
| Open ditches | 12.66 | 0.24 | 0.14 | 0.21 |
| Driveways in crop fields | 11.43 | 0.22 | 0.12 | 0.19 |
| Rough or steep land | 11.27 | 0.21 | 0.12 | 0.19 |
| Land shaded by woodlots | 6.68 | 0.13 | 0.07 | 0.11 |
| Trees in fields | 5.25 | 0.10 | 0.06 | 0.09 |
| Stone outcrops | 2.17 | 0.04 | 0.02 | 0.04 |
| Barns in fields | 2.15 | 0.04 | 0.02 | 0.04 |
| Stone piles | 1.42 | 0.03 | 0.02 | 0.02 |
| Total crop land not producing a crop | 210.11 | 3.96 | 2.29 | 3.46 |
| Land in cropped fields producing a crop: | | | | |
| Crops other than fruit: | | | | |
| Not rotated: | | | | |
| Permanent meadow | 106.07 | 2.00 | 1.15 | 1.75 |
| Gardens, etc | 28.70 | 0.54 | 0.31 | 0.47 |
| Total not rotated | 134.77 | 2.54 | 1.47 | 2.22 |
| Rotated: | | | | |
| General crops | 4,417.06 | 83.34 | 48.06 | 72.69 |
| Truck crops | 88.38 | 1.67 | 0.96 | 1.45 |
| Crop land sometimes pastured | 645.85 | 12.19 | 7.03 | 10.63 |
| Total rotated | 5,151.29 | 97.19 | 56.05 | 84.77 |
| Total crops other than fruit | 5,286.06 | 99.74 | 57.51 | 86.99 |
| Fruit: | | | | |
| Home and tenant orchards | 44.76 | 0.84 | 0.49 | 0.74 |
| Commercial fruit: | | | | |
| Bearing | 351.55 | 6.63 | 3.82 | 5.79 |
| Not bearing | 184.38 | 3.48 | 2.01 | 3.03 |
| Total commercial | 535.93 | 10.11 | 5.83 | 8.82 |
| Total fruit | 580.69 | 10.96 | 6.32 | 9.56 |
| Total area of all crops | 5,866.75 | 110.69 | 63.83 | 96.54 |
| Total area of farms | 9,191.06 | 173.42 | 100.00 | ..... |

The proportion of land occupied by obstructions in fields devoted to crops other than fruit, on farms of different sizes, is shown in table 24. With fruit crops very little land is made untillable by fences, open ditches, streams, or other causes, and the inclusion of land devoted to fruit would

TABLE 24. RELATION OF SIZE OF FARMS TO PROPORTION OF AREA OF CROPPED FIELDS OCCUPIED BY OBSTRUCTIONS

| | Size of farms | | | |
|---|---|---|---|---|
| | Less than 100 acres | 100–174.9 acres | 175 acres or more | All farms |
| | Per cent of area of cropped fields occupied by obstructions | | | |
| Fence rows | 2.42 | 1.78 | 1.79 | 1.84 |
| Swampy land | 0.87 | 0.92 | 0.31 | 0.55 |
| Streams | 0.63 | 0.38 | 0.45 | 0.44 |
| Open ditches | 0.20 | 0.38 | 0.16 | 0.23 |
| Driveways in crop fields | 0.49 | 0 23 | 0 13 | 0 20 |
| Rough or steep land | 0.43 | 0 28 | 0 08 | 0 17 |
| Land shaded by woodlots | 0.18 | 0 09 | 0.13 | 0 13 |
| Trees in fields | 0.02 | 0.02 | 0.15 | 0.10 |
| Stone outcrops | 0.16 | 0.01 | 0.01 | 0.03 |
| Barns in fields | 0.02 | 0.05 | 0.04 | 0.04 |
| Stone piles | 0.02 | 0.02 | 0.02 | 0.03 |
| Total land in cropped fields occupied by obstructions (not producing a crop) | 5.48 | 4.18 | 3.25 | 3.76 |
| Land in cropped fields producing a crop | 94.52 | 95.82 | 96 75 | 96.24 |

tend to obscure the effect of any factor on the proportion of crop land made untillable by these agents. The most important reason for the better utilization of crop land on the larger farms is that a smaller proportion of the crop area is occupied by fences. The larger fields of the large farms require less fence to the acre, and therefore less land is occupied by fence rows.

### PASTURE LAND

Pasture land is intermediate in grade between crop land and woodland. In some parts of the State there are considerable areas of land which cannot be economically tilled but on which bluegrass or other pasture plants thrive. This land may be either too wet, too dry, too steep, too

stony, too distant, or of too heavy soil for economic crop production, or it may be bottom land subject to overflow. Such areas can generally be used best as permanent pasture. If the land is not suitable for pasture it should be put into a woodlot.

In other parts of the State nearly all of the land is tillable and can be farmed satisfactorily. Even in such regions there is some broken land along streams which can best be utilized as permanent pasture, but most of the tillable land is cropped. A few exceptional regions may be found where good tillable land is kept in pasture a large part of the time because it is peculiarly adapted to that purpose. Outside of these favored regions there is a tendency to keep little stock unless part of the land is suited only for pasture. In regions where practically all of the farm land is tillable, the farmers who keep stock often rotate pastures since by this practice more stock can be kept on a given area. Rotated pastures are usually better on light soils or with other conditions under which bluegrass does not thrive.

The classification of pasture land on the farms studied is shown in table 25. Pasture land classified as "Tillable" includes all land ready for cultivation which is as good as the land now in crops. The amount under "Could be made tillable" includes land which at reasonable expense could be made as good tillable land as that now under cultivation. In the case of "Woods pastured," it would of course be necessary to clear the land of trees.

Of the fifty-three farms here included, only three had no pasture land. All of these are located in western New York and kept little stock. Of the fifty farms having pasture, forty-five depended primarily on permanent pasture while five depended principally on rotated pasture. Nine of the forty-five farms depending primarily on permanent pasture supplemented this by some rotated pasture. All except one of these nine farms were intensive dairy farms. They had an average of 22.8 acres of rotated pasture, 92.3 acres of permanent pasture, and 30.5 cattle units, to each farm. Of the five farms depending primarily on rotated pasture, only two had more than six cows. They had an average of 18.1 acres of rotated pasture and 2.9 acres of permanent pasture to each farm.

The total pasture area occupied about 30 per cent of the area of these fifty-three farms, or 51.9 acres per farm. The 881.49 acres of woodland pasture was estimated by these farmers to furnish feed equivalent to

TABLE 25. CLASSIFICATION OF PASTURE LAND ON FIFTY-THREE NEW YORK FARMS

| | Total number of acres | Number of acres per farm | Per cent of total farm area | Per cent of total pasture area |
|---|---|---|---|---|
| Permanent pasture: | | | | |
| Cleared: | | | | |
| Tillable: | | | | |
| Lanes | 17.46 | 0.33 | 0.19 | 0.63 |
| Other land | 200.46 | 3.78 | 2.18 | 7.29 |
| Total tillable | 217.92 | 4.11 | 2.37 | 7.92 |
| Could be made tillable: | | | | |
| Lanes | 6.20 | 0.12 | 0.07 | 0.23 |
| Other land | 840.31 | 15.85 | 9.14 | 30.54 |
| Total which could be made tillable | 846.51 | 15.97 | 9.21 | 30.76 |
| Not tillable | 542.37 | 10.23 | 5.90 | 19.71 |
| Total cleared | 1,606.80 | 30.32 | 17.48 | 58.39 |
| Woods pastured: | | | | |
| Tillable if cleared | 395 79 | 7.47 | 4.31 | 14.38 |
| Could be made tillable | 89.83 | 1.69 | 0.98 | 3.26 |
| Not tillable | 395.87 | 7.47 | 4.31 | 14.39 |
| Total woods pastured | 881.49 | 16.63 | 9.59 | 32.04 |
| Area of cleared pasture to which woods pastured is equivalent | 176.44 | 3.33 | ..... | ..... |
| Total permanent pasture | 2,188.29 | 46.95 | 27.07 | 90.43 |
| Crop land temporarily pastured | 263.33 | 4.97 | 2.87 | 9 57 |
| Total pasture area | 2.751.62 | 51.92 | 29.94 | 100.00 |
| Area of cleared pasture to which total pasture is equivalent | 2,046.57 | 38.61 | 22.27 | 74.38 |
| Total farm area | 9,191.06 | 173.42 | 100.00 | ..... |

176.44 acres of cleared pasture. The 51.9 acres of all pasture per farm was thus equivalent to 38.6 acres of cleared pasture, or 2.3 acres of cleared pasture for each cattle unit on these farms. Permanent pasture made up 90 per cent of the total pasture area. About two-thirds of the area

of the permanent pasture was cleared, but since it took about 5 acres of woods pasture to furnish as much feed as 1 acre of cleared pasture, the latter furnished about 90 per cent of the feed. Only a small part, one-seventh, of the cleared permanent pasture was then tillable, but more could be made tillable at reasonable expense. If conditions warranted, about two-thirds of the cleared permanent pasture land on these farms could be used for producing crops.

In general the selection of the pasture land on these farms followed the principles already discussed. The greater part of the pasture land was not adapted to crop production. In some cases this untillable pasture was supplemented by small areas of rotated pasture, consisting usually of the remoter crop fields. In general, the farms that had little or no untillable land kept little stock.

The location of the pastures on most farms is determined by the character of the land. Land that is not suited to crop production is used for pasture, whatever its location. Where the land of a farm is uniform and choice is possible, it is usually best to pasture the land that is remotest from the buildings. Long experience has proved that this plan is usually the best. The more conveniently located fields are worth more for cultivation, and labor is saved by pasturing the fields which cannot be farmed as advantageously. Distance from buildings is less important with pasture than with crop land, for where the barns and the pasture are connected by a lane the stock do most of the traveling. It is very advantageous, however, to have a night pasture convenient to the buildings. Altho this need not be as large as the day pasture, it should be large enough to furnish some feed.

Aside from interest and taxes, the principal cost in the upkeep of pastures is the cost of maintaining fences. Since the amount of fence to the acre is affected by both the size and the shape of the field, these factors are of some importance. The relation of the size of the field to the cost of fence maintenance is shown in table 26. Assuming that the costs of maintaining all pasture fence are chargeable to the pastures, at 6 cents a rod the cost of maintaining the fences around the 2-acre pastures in table 26 would be $2.45 an acre. This is as much as the usual rent of land worth $40 an acre. A considerable proportion of pasture land is worth only $20 or $25 an acre. Because of this, in regions where land is cheap small patches are often seen lying idle. On the basis of the

TABLE 26. RELATION OF SIZE OF PASTURES TO ECONOMY OF FENCING

| Size of pasture fields (acres) | Number of fields | Average size of fields (acres) | Rods of fence to the acre | Annual cost of fence maintenance per acre at 6 cents a rod |
|---|---|---|---|---|
| Less than 4 | 29 | 2.07 | 40.8 | $2.45 |
| 4–7.9 | 25 | 5.75 | 25.2 | 1.51 |
| 8–11.9 | 12 | 9.75 | 19.0 | 1.14 |
| 12–15.9 | 12 | 14.02 | 19.2 | 1.15 |
| 16–23.9 | 12 | 19.72 | 13.6 | 0.82 |
| 24–49.9 | 17 | 36.03 | 10.6 | 0.64 |
| 50 or more | 13 | 84.46 | 6.4 | 0.38 |
| Total | 120 | ..... | ..... | ..... |
| Average | ..... | 20.30 | 11.8 | $0.71 |

difference in cost of maintaining fences, the 84-acre pastures would be worth about $35 an acre more than the 2-acre pastures, since it costs $2.07 an acre less each year to keep the large pastures fenced. For these reasons, land that is to be pastured should be arranged in as large fields as possible. Usually part of the pasture fence is line fence, half of which is maintained by neighbors, and part may serve other purposes. An ideal pasture would be square, but the utilization of the different grades of farm land for the purposes to which each grade is best adapted is far more important than shape of the pasture. This factor, not economy of fencing, usually determines the shape of pasture fields.

### WOODLAND

Woodland is the lowest grade of farm land. There are large areas in the country which are too steep or too remote, or on which the soil is too rocky or too poor, to produce economically any other crop than woods. To utilize land that is suitable for higher uses as woodland, is to put it in direct competition with the large areas which are suited only to timber production and on which timber can be produced at much lower cost. For these reasons farm woodlots should be located on land that is too rough, too steep, too poor, or too remote to be used economically for crop production or for pasture.

Much of the farm land of the State was originally cleared without due reference to topography or to the character of the soil. As a result many woodlots occupy level, rich, tillable land, while poor, barren hillsides, too steep for crops or even for good pasture, were cleared. In order to correct these mistakes in clearing, some readjustments were necessary. It did not take many years of experience to determine that some land had been cleared by mistake. Part of this land has already gone back into forest. More should go. On the other hand, the increasing scarcity of good land as reflected in higher prices has stimulated the clearing of some of the woodlots on the highest-priced land. As time goes on, this process may be expected to continue.

The proportion of woodland on the farms studied, and the purposes to which it is adapted, in the opinion of the writer, are shown in table 27. The woodland classed as "Tillable if cleared" would be approximately as good land as that now under cultivation. Woodland classed as "Could be made tillable" includes land which, after clearing, could be made tillable at reasonable expense either by drainage, by clearing of stone, or by other means. Woodland not tillable is divided into two classes, that which would make good pasture after clearing and that which is suited only for woodland.

Of the fifty-three farms included in this study, forty-three, or about four-fifths of the total, had woodlots. A larger proportion of the large farms had woodland. Of thirteen farms containing less than 100 acres, eight had woodlots; while of twenty containing more than 175 acres, all except one had some woodland. The average area of woodland per farm was 21.6 acres, or about 12 per cent of the farm area. The proportion of the farm area in woodland is less on the smaller farms than on the larger farms. On the smaller farms land is generally too scarce to be used for forestry purposes.

About half of the woodland on these farms, if cleared, would make as good tillable land as that now under cultivation, without additional expense. In addition to this, about one-seventh of the area of woodland could be made tillable at reasonable expense, after clearing. Most of the remaining woodland would make good pasture land if cleared. About 10 per cent of the total area of woodland on these farms is suited only for timber production.

TABLE 27. CLASSIFICATION OF WOODLAND ON FIFTY-THREE NEW YORK FARMS

| | Total number of acres | Number of acres per farm | Per cent of total farm area | Per cent of total woodland area |
|---|---|---|---|---|
| Woodland pastured: | | | | |
| Tillable if cleared | 395.79 | 7.47 | 4.31 | 34 64 |
| Could be made tillable | 86.83 | 1.69 | 0.98 | 7 86 |
| Not tillable: | | | | |
| Suitable for pasture | 297.09 | 5.61 | 3.23 | 26.00 |
| Suitable only for woodland | 98.78 | 1.86 | 1.07 | 8.65 |
| Total not tillable | 395.87 | 7.47 | 4.31 | 34.65 |
| Total woodland pastured | 881 49 | 16.63 | 9.59 | 77 15 |
| Woodland not pastured: | | | | |
| Tillable if cleared | 151.89 | 2.87 | 1.65 | 13.29 |
| Could be made tillable | 64.33 | 1.21 | 0.70 | 5.63 |
| Not tillable: | | | | |
| Suitable for pasture | 22.30 | 0.42 | 0.24 | 1 95 |
| Suitable only for woodland | 22.58 | 0.43 | 0.25 | 1 98 |
| Total not tillable | 44.88 | 0.85 | 0.49 | 3.93 |
| Total woodland not pastured | 261.10 | 4.93 | 2.84 | 22 85 |
| All woodland: | | | | |
| Tillable if cleared | 547.68 | 10.33 | 5.96 | 47.93 |
| Could be made tillable | 154.16 | 2.91 | 1.68 | 13.49 |
| Not tillable: | | | | |
| Suitable for pasture | 319.39 | 6.03 | 3.48 | 27 95 |
| Suitable only for woodland | 121.36 | 2.29 | 1.32 | 10.62 |
| Total not tillable | 440.75 | 8.32 | 4.80 | 38.57 |
| Total woodland area | 1,142.59 | 21.56 | 12.43 | 100.00 |
| Total farm area | 9,191.06 | 173.42 | 100.00 | ..... |

It should not be inferred from this that all of the woodland suited to crops or pasture should be cleared at once. Some of it should never be cleared. In deciding whether to cut or to leave a woodlot, the most important considerations are the value of the land for other purposes, and the kind of timber in the woodlot. Where land is moderately high in price it will seldom pay to leave good level tillable land in woods. Usually it will be best to cut the timber and gradually clear such land. It seldom

pays to reforest land worth more than $10 an acre, but it may pay to leave a growing stand of valuable timber until maturity on land worth more. Practically all of the farm land in New York State which will make good crop or pasture land is too valuable to be used for commercial timber production.

Farm woodlots are often justified on land that is too valuable for commercial forestry purposes. In producing fence posts, firewood, and lumber for home use, a farmer is saving himself the retail prices of these products. In selling lumber he must sell on a wholesale market. The saving between the retail and the wholesale prices of these products, and the saving in hauling both ways, will pay the interest on higher-priced land.

A few woodlots have value as windbreaks. While less important in New York State than on the western plains, a windbreak is very desirable for buildings located in an exposed position. This consideration is negligible on most farms, however, as the woodlots are not usually located so as to be of any use for this purpose. On the other hand, woodlots frequently injure adjacent crop land by their shade or by keeping the land too wet. The width of the strip of land wasted because of proximity to woodlots varies from 1 to 4 rods. On the farms included in this study, about 7 acres of crop land in fields adjacent to woodlots was thus wasted. This increases somewhat the expense of maintaining woodlots.

Most farms have more woodland than is needed for home use, and much of this woodland has little or no valuable timber. Where such land is suited to crops or pasture, it will usually pay to cut the timber in order that the land may be used for the purpose which pays best. Pasture is a more valuable crop than timber, and the returns from pasture are not so long deferred.

On these farms an average of 11.8 rods of fence was required to inclose an acre of pasture (table 26, page 493), and the annual cost of fence maintenance, at 6 cents a rod, would therefore be 71 cents an acre. If 2 acres of pasture will support a cow for the pasture season, and if the value of her pasture is $10, the returns from an acre will pay for fence maintenance, taxes, and interest at 6 per cent on a value of about $60 an acre. On the same basis, if 3 acres of pasture are needed to support a cow, the land is worth about $37 an acre as pasture; if 4 acres are needed for each cow, the land is worth $25 an acre; and if 5 acres are needed for

each cow, the land is worth $18 an acre. If more than 5 acres are needed to support a cow, it may be worth while to consider the possibilities of the land if it is allowed to remain in forest.

After the owner has decided to clear a woodlot, the question arises as to whether it should be cleared at once or pastured until the stumps rot. In deciding this point, it is necessary to consider how great is the need for the land, how good pasture it will make, the cost of clearing, and how near the land is to the buildings. Often, if land is needed at once, cleared land can be bought more cheaply than woodland can be cleared. Clearing land at once puts today's high-priced labor in competition with the cheaper labor of the past, when most of the land was cleared. Usually pasture land is needed, and such cut-over land can be pastured to good advantage until the stumps rot. This usually requires from ten to twenty years and then the land can be cleared cheaply.

About four-fifths of the woodland on the farms studied was pastured. Most of the woodland which was not pastured was either not convenient for pasturing or not worth pasturing. Undoubtedly pasturing injures woodlots to some extent. Where land is worth $20 or more an acre as pasture, the more important question is as to whether woods should be allowed in the pasture. Five acres of woodland pasture was considered equivalent to one acre of cleared pasture on these farms. It is well to have some trees in a pasture, to provide shade. Pasture in open woods is often as good as cleared pasture. It may be possible to produce wood and posts for home use by this arrangement without serious injury to the pasture.

The plan of a western New York farm is shown in figure 131. The location of the woodlot V, on level, tillable land near the buildings, is typical of many farms. Such land is too valuable for forestry purposes. Cleared tillable land in this region is worth $100 or more an acre. While this large area of level, tillable land has been left in woods, many fields far from the buildings have been cropped. Field R, which has been cropped regularly, is 188 rods farther from the buildings than woodlot V. For general farm purposes, with 1918 labor prices, field V would be worth from $30 to $35 an acre more than field R, on the basis of location alone. It is also better land. Field R is but a few rods from a neighbor's barn, but it is 234 rods away, uphill, from the barn of the man who farms it.

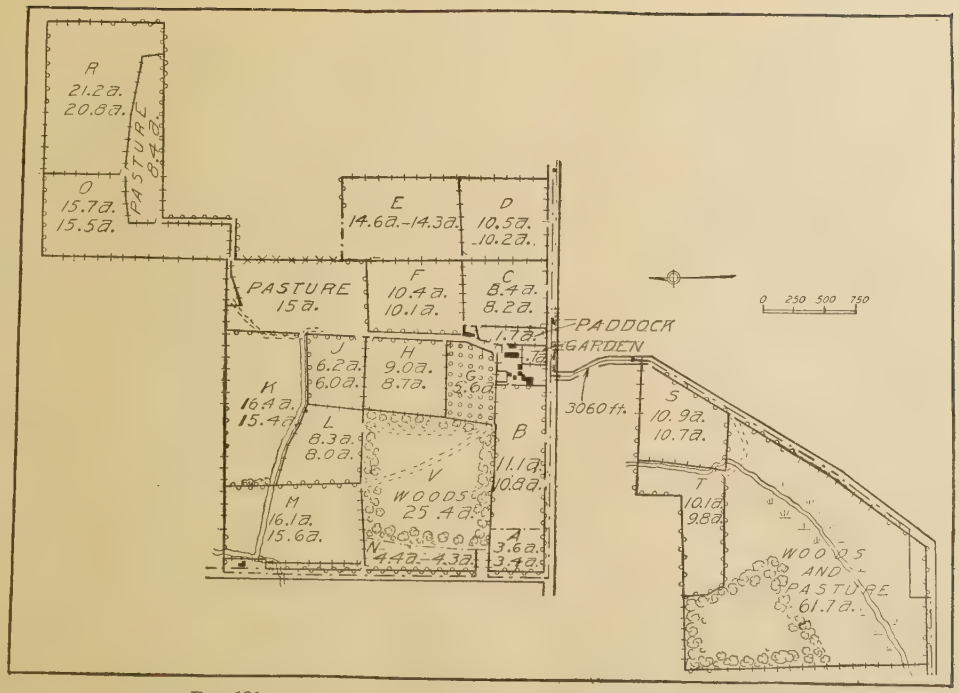


FIG. 131. UNECONOMIC WOODLAND ON A WESTERN NEW YORK FARM

The woodlot V occupies level tillable land near the buildings and worth $100 an acre if cleared. This is a large farm with relatively small fields, many of which are of undesirable shape. It could be easily and cheaply rearranged by taking out some unnecessary fences and tiling one open ditch

Farm area, 306.2 acres
Average size of farmed fields, 10.4 acres
Average distance to farmed fields, 118 rods

The plan of another western New York farm having a woodlot located on good tillable land is shown in figure 132. On this farm the woodland is being gradually cleared for cultivation as opportunity offers. In this case the land is being cleared at once, without waiting for the stumps to rot. During 1916 and 1917 about two acres of land on the north and east sides of the woodlot were added to the cultivated area. In a few years the entire woodlot will be cleared and under cultivation. Crop land here is worth $125 an acre.

These readjustments in the utilization of woodland will not come in a day. In addition to the owner of the farm shown in figure 132, four other farmers out of the forty-three having woodlots have definitely planned to clear them for cultivation. On some of these farms the timber has already been cut. On most of them the stump lots will be pastured for a term of years before final clearing. The farmers having high-priced land are naturally the first ones to begin clearing woodland. The present high price for firewood is enabling some farmers to make wages cutting woodland which has no valuable timber, and so is stimulating the process. As population increases and the consequent scarcity of land relative to population is reflected in higher land prices, the area of crop land in New York will be considerably increased in this way.

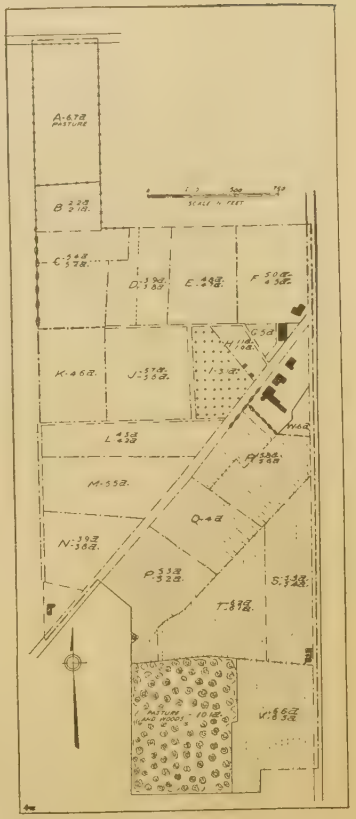


FIG. 132. ANOTHER UNECONOMIC WOODLOT OCCUPYING TILLABLE LAND TOO VALUABLE FOR TIMBER PRODUCTION

This woodlot is being gradually cleared for cultivation, the work being done in slack periods. Nearly all of this farm south of the road was originally swampy pasture. It was reclaimed for cultivation by a complete system of tile drains. Only valuable crop land would be worth reclaiming at such expense. Small fields are necessary on this farm as the land is largely devoted to truck crops

Farm area, 108.4 acres
Average size of farmed fields, 4 acres
Average distance to farmed fields, 52 rods

PUBLIC HIGHWAYS

In most parts of New York State the owner of a farm holds title to the land in the adjacent highway, the only right of the public to the latter being the right to its free and uninterrupted use for highway purposes. The area of a farm as given in the deed therefore usually includes the area of all roads running thru the farm and one-half the area of roads bounding the farm. While land in highways is technically owned by the owners of adjacent farms, little of this land is used for producing crops and so it adds nothing directly to the farm income. However, the importance of good roads is so great in economic farm operation that the land necessarily occupied by good, well-planned roads is one of the most valuable assets of a farm.

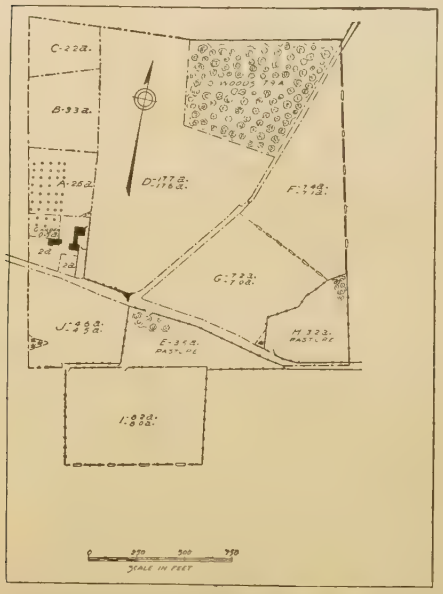


FIG. 133. PLAN OF A SOUTHERN NEW YORK FARM

The crooked highways which cross this farm not only occupy much land but also cause the irregular shape of several of the fields. The area of the right of way of the highway is 5.1 per cent of the farm area. Part of the roadside is cropped, the area of the highway not in crops being 3.7 per cent of the farm area

Farm area, 72.7 acres
Average size of farmed fields, 6.5 acres
Average distance to farmed fields, 35 rods

In that part of the State which was settled last, much of the land was laid out in squares, with straight roads in so far as topography permitted. Since this section is relatively level, the highways as a rule are straight. In the eastern and southeastern parts of the State, which were settled first, the roads were not planned, but developed, like the farm layouts, largely by chance. In general the roads tend to follow the topography of the land, avoiding the steepest grades. Even where there are no grades to avoid, many of the highways are crooked (fig. 133). The most serious effect of these crooked roads on farm

layout is that they divide many farms into irregularly shaped parts which are inconvenient to work and difficult to fence.

The amount of land in highways on the farms studied is shown in table 28. The average area of highways per farm was 3.13 acres, or 1.8 per cent of the total farm area. Apparently size of farm has little effect on the proportion of the area in highways. On farms of less than 100 acres

TABLE 28. LAND IN HIGHWAYS ON FIFTY-THREE NEW YORK FARMS

| | Total number of acres | Number of acres per farm | Per cent of total farm area | Per cent of area of legal right of way of highways |
|---|---|---|---|---|
| Land in highways not cropped | 144.75 | 2.73 | 1.57 | 87.19 |
| Land in highways cropped: | | | | |
| General crops | 16.57 | 0.31 | 0.18 | 9.98 |
| Apple trees | 4.69 | 0.09 | 0.05 | 2.83 |
| Total land in highways cropped | 21.26 | 0.40 | 0.23 | 12.81 |
| Total land in highways | 166.01 | 3.13 | 1.81 | 100.00 |
| Total farm area | 9,191.06 | 173.42 | 100.00 | ..... |

the proportion of the farm area in legal right of way of highways was 1.8 per cent, on farms between 100 and 175 acres in size it was 2.1 per cent, and on farms of more than 175 acres it was 1.7 per cent. There was considerable variation for the different farms, the proportions varying from 0.4 to 5.1 per cent. In the purchase of a farm the proportion of the area occupied by roads is of some importance, as every acre so used reduces by that amount the productive area of the farm.

About one-eighth of the total area of highways on these farms was producing crops. In a few cases apple trees were planted along the highway, thus utilizing land that would otherwise have produced only weeds. The principal disadvantages of this way of utilizing roadsides is the inconvenience of spraying and taking care of a single row of trees. Further, while the fruit as well as the land belongs to the farmer as much as does any crop on his farm, he will probably harvest a smaller proportion

of it because of its convenience to travelers. The greater part of the area of the roadside cropped on these farms was in general crops. On some farms road fences were not maintained and the fields were tilled to the road ditch, all the land not actually occupied by the road being thus utilized.

The usual width of a country highway in New York is 3 rods, but occasional highways are 4 or even 5 rods wide. The public has the right to free and uninterrupted use for highway purposes of such a proportion

Fig. 134. A stone row which renders useless an acre of land worth $100
By clearing away these stones a strip of land 2 rods wide could be added to the adjoining field

of this land as is necessary for the traffic. The actual width of a well-graded dirt road is very seldom more than 1½ rods, while the width of macadam roads is usually less than 2 rods. The traveled area of many country roads is less than 1 rod in width. Where the roads are fenced, the balance of the right of way is usually covered with grass, weeds, and brush. The state highway law requires each property owner to mow his roadsides twice each year. They are usually mowed once, but the hay obtained is dusty and of very poor quality. Most farmers would be glad if some one would mow their roadsides for the hay. In other words, the roadsides of most farms are worse than merely useless, since constant expense is necessary to keep the weeds down. Road fences are

longer obligatory in New York, as stock running loose on the highway regarded as trespassing. Consequently, where road fences are unnecsary, their removal would result in a twofold saving. Not only would considerable area be added to the crop land, but the labor of mowing adsides would be saved (figs. 134 and 135). Such a change would not terfere in any way with the usefulness of the roads as highways and ould improve the appearance of the roadsides. Certainly a road

Fig. 135. WHERE ROAD FENCES ARE UNNECESSARY THEIR REMOVAL PERMITS FARMING TO THE ROAD DITCH

This road occupies less than a rod of land

bordered by well-cared-for crops presents a far more attractive appearance than one bordered by brush and weeds.

On these farms about 21 acres have already been added to the crop area by reclaiming useless roadsides. By eliminating unnecessary road fences about 30 acres more could be added to the land in crops. The width of the strip of land gained depends on the width of the road and the topography of the land. Where the road is of ordinary width and is not bordered by steep banks, a strip of land from $\frac{1}{2}$ to 1 rod wide can usually be added to the crop land on each side.

The question of fencing roadsides depends primarily on the stock kept on the farm. It is of course necessary to fence pastures bordering on the road, and where much stock is kept it is frequently profitable to fence some crop fields in order to pasture the aftermath. In New York it seldom pays to fence against stock driven along the road. The average length of roadside on these farms was 324 rods, 62 per cent of which was fenced. The proportion of roadside fenced varied for all the farms, from 52 per cent on the farms of less than 100 acres, to 72 per cent on farms of more than 240 acres. Many road fences are barriers only to cultivation, being of no use whatever in turning stray stock. Where such useless or unnecessary fences can be removed at a reasonable cost, the double saving of land and labor will usually justify the expense.

### THE FARMSTEAD

The farmstead, as the term is here used, is that part of the farm which is occupied by the main group of farm buildings, together with any adjoining yards or paddocks, the home orchards, and the home garden. A part of the area of every farm must be devoted to these purposes, the size of the necessary area depending on the size of the farm, the type of farming, and other factors. Aside from the orchard, the garden, and the paddocks, every acre devoted to use as farmstead reduces by that amount the productive area of the farm. Land necessarily occupied by well-planned buildings is usefully employed and adds to the value of the farm. Since the farmstead usually occupies the best tillable land, it is essential that it be well planned in order to make the best use of land as well as of labor.

The location of the farmstead with reference to fields has already been discussed. The ideal location for a farmstead is on a public road in the center of the crop area. With farms of small or moderate size it is best to locate the farmstead as near the center of the crop land as it can be placed and still be on the road. With very large farms the importance of saving labor in travel to and from fields is so great that it is best to locate the farmstead at the center of the farm.

While it is advantageous to have reasonably close neighbors, it is not usually preferable to have them directly across the road. The neighbor's children, dogs, and chickens will give less trouble if the houses are some

distance apart. It is a distinct advantage to own and control both sides of the road.

The ideal location for a farmstead is on a slight elevation, sufficient to give good drainage but not enough to make hauling difficult. Altho less important in New York than in the West, it is advisable to have the farmstead sheltered from strong prevailing winds by a windbreak.

Frequently the buildings of a farmstead are on both sides of the road, the house being on one side and the barns on the other. This arrangement is usually bad. There is great danger of injury to persons and stock by automobiles running between the house and the barn. The barns and the necessary implements near by do not make an attractive view either from the front windows of the house or from the road. The house should be located far enough from the road to escape the dust but not far enough to make too large a lawn. The distance from the house to the edge of the road on the farms studied varied from 30 to 160 feet, averaging about 65 feet. Where the distance was greater than 100 feet the lawns were not usually well kept. The best location for the barn is at a convenient distance behind the house. With such an arrangement the piles of lumber and the necessary tools can be kept out of sight from the road, and this location is preferable from every point of view.

The utilization of the land in farmsteads on the farms included in this study is shown in table 29. The average size of the garden area included in the farmsteads of these farms was about one-third of an acre to each farm. Three farms had gardens in crop fields which were not included in the table. Including these, the area of garden to each farm was about 0.4 acre. Forty-seven out of fifty-three farms had gardens large enough to be recognized as such. Of the six farms having no garden, three were truck farms and hence needed none. In addition to the definite garden area, most farmers grew potatoes in the crop fields for home use.

The farm garden should be one of the most profitable enterprises on a farm. By proper arrangement, little more time is required to take care of the garden than to take care of a similar area in potatoes or corn. Since garden work conflicts with work on crops, the garden should be arranged to save labor. It should be located near the house for convenience in working. The area necessary depends on the size of the family. In this study, on the farms where the family consisted of the equivalent of three adults the average size of garden was 0.3 acre; on those where

the family consisted of the equivalent of more than three but less than five adults, the average size of garden was 0.4 acre; and on those where the family consisted of the equivalent of five or more adults, the average size of garden was 0.6 acre. This is an average of about 0.1 acre of garden to each adult person or equivalent.

TABLE 29. Land in Farmsteads on Fifty-three New York Farms

| | Total number of acres | Number of acres per farm | Per cent of total farm area | Per cent of total farmstead area |
|---|---|---|---|---|
| Farmstead crops: | | | | |
| Home garden: | | | | |
| Separate garden | 15.98 | 0.30 | 0.17 | 9.80 |
| Garden in orchard | 2.35 | 0.04 | ..... | ..... |
| Total home garden | 18.33 | 0.35 | ..... | ..... |
| Home orchard: | | | | |
| Apple | 40.54 | 0.76 | 0.44 | 24.87 |
| Mixed fruit | 2.90 | 0.05 | 0.03 | 1.78 |
| Total home orchard | 43.44 | 0.82 | 0.47 | 26.65 |
| Other farmstead crops | 2.63 | 0.05 | 0.03 | 1.61 |
| Pasture: | | | | |
| Paddock | 12.69 | 0.24 | 0.14 | 7.78 |
| Pasture in orchard | 17.16 | 0.32 | ..... | ..... |
| Total farmstead pasture | 29.85 | 0.56 | ..... | ..... |
| Land occupied by buildings, lawns, barnyards, drives, etc. | 88.28 | 1.67 | 0.96 | 54.15 |
| Total farmstead area (less double cropping) | 163.02 | 3.08 | 1.77 | 100.00 |
| Total farm area | 9,191.06 | 173.42 | 100.00 | ..... |

The average size of home orchards was about 0.8 acre to each farm. Thirty-two farms out of the fifty-three had separate home orchards. Of the twenty-one farms not having home orchards, nineteen had commercial orchards from which fruit for home use was obtained, and the other two were in regions where apples do not thrive. The average area of home orchards for the farms having such orchards was 1.36 acres. More than

90 per cent of the area of home orchards was in apples, the remainder being devoted to mixed fruits.

The average area in paddocks for all farms was 0.24 acre. Only eleven farms out of the fifty-three had such farmstead pastures, and the average area of paddocks for these farms was 1.15 acres. Barnyards which afforded no pasture were not included in this classification, but were considered as land occupied by buildings and yards. In lieu of other paddocks, eight farms used the home orchards for this purpose, this being an average of about 2.15 acres for these farms, or 0.32 acre for all the fifty-three farms. All the farms pasturing orchards were located in regions where apples are a very uncertain crop. By pasturing such orchards some return is secured every year, and occasionally some apples are obtained in addition. Where hogs or cattle are kept it is advantageous to have small paddocks or pastures close to the buildings. These may be used for calf, hog, bull, or horse pastures, as the case may require. If land is not too limited, the saving in labor effected by the use of such pastures will often amount to good rental for the land so used.

The area of land occupied by buildings and yards averaged 1.67 acres to each farm (table 30). This included the lawns and barnyards as well as the actual building sites. The lawns on these farms ranged from nothing up to about one-half acre. A few farmers had their gardens in their front yards. Lawns more than half an acre in size are seldom found on the farms of men who make their living from the soil.

Far more important than the waste of good land is the fact that a large area of land occupied by buildings usually indicates scattered buildings and a resulting waste of labor in doing work. The plan of a farmstead with scattered buildings, requiring much unnecessary travel, is shown in figure 136. Several hundred miles of walking would be saved every year with well-arranged, concentrated buildings. Altho fire risk is somewhat greater, fire insurance is cheaper than wasted labor and materials in scattered, inconvenient buildings. The barns must be at least 100 feet from the house if the lowest insurance rates are to be obtained. This is usually far enough so that unpleasant barn odors may be avoided, and any increase in distance beyond this sacrifices some labor. On the farms studied, the average distance from the house to the nearest door of the horse barn was about 130 feet and to the nearest door of the cow barn about 200 feet.

TABLE 30. RELATION OF SIZE OF FARMS TO AREA AND PROPORTION OF LAND IN FARMSTEAD

| | Size of farms (acres) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Less than 100 | 100 to 174.9 | 175 or more | All farms | Less than 100 | 100 to 174.9 | 175 or more | All farms |
| | Acres per farm | | | | Per cent of farm area | | | |
| Farmstead crops: | | | | | | | | |
| Home garden: | | | | | | | | |
| Separate garden | 0.21 | 0.35 | 0.31 | 0.30 | 0.28 | 0.27 | 0.11 | 0.17 |
| Garden in orchard | 0.08 | 0.05 | 0.02 | 0.05 | ..... | ..... | ..... | ..... |
| Total home garden | 0.29 | 0.40 | 0.33 | 0.35 | ..... | ..... | ..... | ..... |
| Home orchard: | | | | | | | | |
| Apple | 0.27 | 0.66 | 1.20 | 0.76 | 0.36 | 0.52 | 0.42 | 0.44 |
| Mixed fruit | 0.11 | 0.06 | 0.01 | 0.06 | 0.14 | 0.05 | 0.01 | 0.03 |
| Total home orchard | 0.38 | 0.72 | 1.21 | 0.82 | 0.50 | 0.57 | 0.43 | 0.47 |
| Other farmstead crops | 0.07 | 0.02 | 0.07 | 0.05 | 0.09 | 0.02 | 0.02 | 0.03 |
| Pasture: | | | | | | | | |
| Paddock | 0.18 | 0.11 | 0.41 | 0.24 | 0.24 | 0.08 | 0.15 | 0.14 |
| Pasture in orchard | ..... | 0.28 | 0.58 | 0.32 | ..... | ..... | ..... | ..... |
| Total farmstead pasture | 0.18 | 0.39 | 0.99 | 0 56 | ..... | ..... | ..... | ..... |
| Land occupied by buildings, lawns, etc. | 1.52 | 1.41 | 2.02 | 1.67 | 1.99 | 1.11 | 0.71 | 0.96 |
| Total farmstead (less double cropping) | 2.36 | 2.61 | 4.02 | 3.08 | 3.10 | 2.05 | 1.42 | 1.78 |
| Total farm area | 76.22 | 127.36 | 282.65 | 173.42 | 100.00 | 100.00 | 100.00 | 100.00 |

The average size of the farmsteads on these farms was 3.08 acres each, or 1.78 per cent of the total farm area. A little less than one-half — 46 per cent — of the total area of the farmsteads was producing some crop, either as garden, orchard, paddock, or otherwise.

The location and the arrangement of most farmsteads are fixed. Since in many cases farmsteads have developed without a definite plan, many of them are not well adapted to present conditions. In spite of this, it seldom pays to make revolutionary changes because of the expense involved. In some cases when farms are combined, the location and the arrangement of the farmstead are so bad that it would pay to plan a new farmstead in a convenient location. Usually, however, changes should be gradual. After a careful study of the farm conditions, a long-time plan for the farmstead and building development should be made.

Gradually, as conditions may justify, changes may be made in accordance with this plan, so that in a reasonable length of time a farmstead will be developed which is well planned and is adapted to existing conditions.

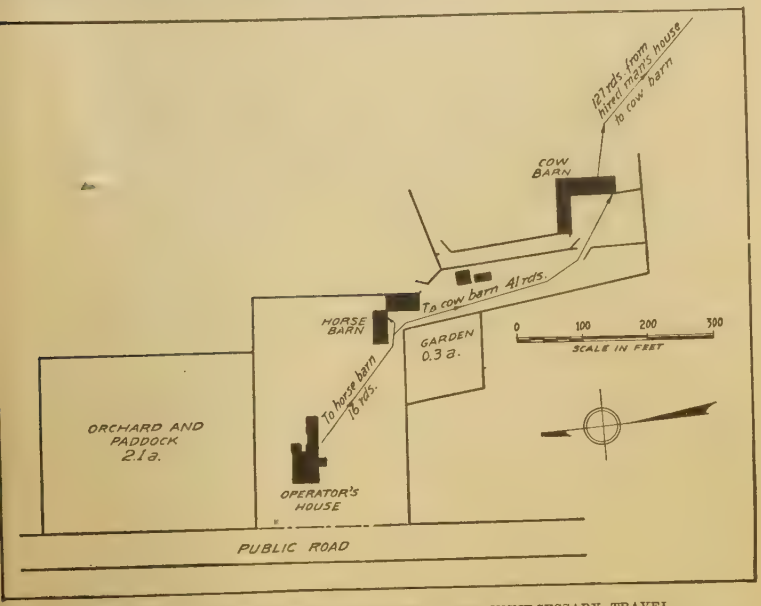


FIG. 136. AN ARRANGEMENT REQUIRING MUCH UNNECESSARY TRAVEL

The area of land occupied by the buildings of this farmstead is 2.82 acres, or 1¼ per cent of the farm area. More than 700 miles of walking would be saved yearly if the cow barn were 500 feet nearer the house

Two well-planned farmsteads are shown in figure 137. Plan I represents the farmstead of a western New York fruit and general farm. Both the owner's house and the tenant house are near the barns, and yet the houses are far enough apart to enable two ordinary families to live harmoniously. Both houses are perhaps located a little too close to the road, but since this is a concrete highway there is little dust. The area occupied by buildings is 1.22 acres, or 1 per cent of the farm area. The barns, rearranged in 1915 by the present owner, are centralized in order to save time in doing

the chores. Plan II represents the farmstead of a western New York general farm. Here, also, labor is saved by having both the owner's house and the tenant house convenient to the barns, and the barns centralized. The owner's house and the tenant house are separated by a part

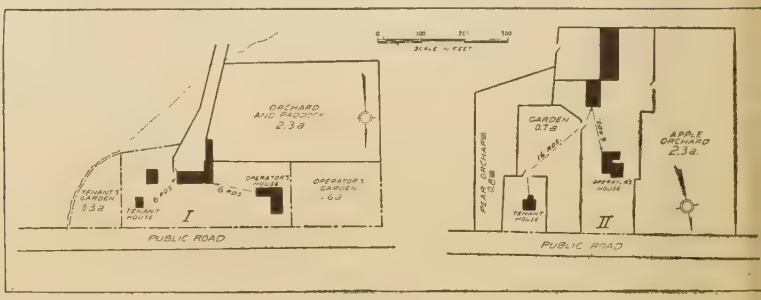


Fig. 137. Two well-planned farmsteads

nership garden, while two orchards furnish an abundance of fruit for home use and some for sale. The area occupied by the buildings of this farmstead is 1.84 acres, or 0.9 per cent of the total farm area. Altho not ideal both farmsteads are conveniently arranged and well adapted to their respective conditions.

### Tenant Houses

Many of the present New York farms are combinations of two or more original farms or parts of farms. Usually each part of the present farm has separate buildings, and, since two farmsteads were unnecessary after combining, the extra house has in many cases been used as a tenant house for the hired man. In some cases inconveniently located houses have been moved to a convenient location near the main farmstead. On many farms tenant houses are still found in their original location, far from the main farmstead and causing the waste of much time in useless travel.

From the standpoint of labor efficiency, tenant houses should be located as near the main farmstead as possible because many trips must be made daily from the hired man's house to the barns. Of course the tenant house should not be too near the barns. A distance of 100 feet is necessary to satisfy insurance regulations.

In order that the two families may live in harmony, it is advisable that the tenant house be located not too close to the owner's dwelling. Each family wishes a certain amount of privacy in its domestic life, but with adjoining houses this is impossible. If the two houses are 20 rods apart both families will be happier and they will be better neighbors.

The location of the tenant houses shown in figure 137 illustrates very satisfactory compromises of these conflicting specifications. Privacy of the two families is secured in each case without sacrifice of convenience.

A striking contrast to these farms is presented by the arrangement shown in figure 136 (page 509). The tenant house on this dairy farm is located 127 rods from the cow barn. The hired man makes three round trips daily on week days and two on Sundays, and in doing this he travels 810 miles a year between his home and the cow barn. When walking is bad across the fields, his trip is longer. If the tenant house were located 100 feet from the barn, less than 40 miles of walking in a year would be necessary. To walk the extra distance necessary with the present location, at an ordinary speed of three miles an hour, would require 257 hours, or nearly twenty-six days. At $2.25 a day the time wasted in useless travel amounts to $58 a year. This tenant house is valued at $400. If it could be moved to a convenient location for $400, the time saved would pay about 15 per cent interest on the investment. While not all of this traveling is done during working hours, the farmer nevertheless pays for it all in lowered efficiency of the man. A hired man working hard every day does not need any such amount of additional exercise.

In this particular case the hired man's wife milks twice daily, as is the custom in southeastern New York. In her two round trips daily the hired man's wife walks 571 miles a year. The two thus walk 1381 miles a year between their house and the barns. Probably the wife gets no extra compensation for her additional exercise, so that it involves no direct financial outlay. It is quite certain, however, that a conveniently located tenant house would go a long way toward settling labor troubles on this farm and would prove an excellent investment for the owner.

Another inconveniently located tenant house is shown in figure 138. The distance from the tenant house A to the cow-barn door is 140 rods. At present a milking machine is used on this farm, and so the hired man does not milk in the mornings. He thus makes two round trips daily, or 630 miles a year. At $2.50 a day the time thus spent would amount

to $52.50 a year. Half of these trips come out of the operator's time directly. The other half he pays for indirectly, perhaps unconsciously. Such a walk would be recreation to a factory worker or a clerk, but to a man who works hard at physical labor all day it is a part of the day's work. Probably this tenant house would be worth $500 or $600 more if it were located in the orchard near the main farmstead.

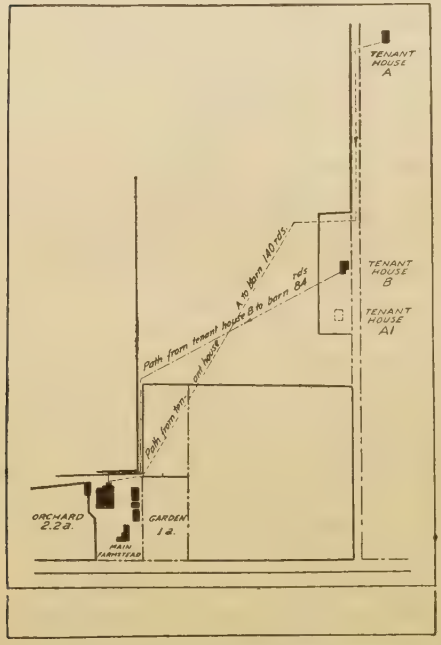
TENANT HOUSE A
TENANT HOUSE B
TENANT HOUSE A1
Path from tenant house A to barn 140 rds.
Path from tenant house B to barn 84 rds
Path from tenant house A1 to barn
ORCHARD 2.2a.
GARDEN 1a.
MAIN FARMSTEAD

FIG. 138. PLAN SHOWING IMPROVEMENT IN LOCATION OF TENANT HOUSE

The hired man on this farm formerly lived in tenant house A, 140 rods distant from the main farm barns. This location necessitated a minimum of 630 miles of walking yearly between the tenant house and the barn. In 1918 the owner purchased the intervening farm and the hired man moved into tenant house B. This location is 56 rods nearer the barn and saves at least 250 miles of walking, or about 80 hours, in a year

The owner of this farm recently bought the small intervening farm, on which is located tenant house B. The distance from here to the cow-barn is 56 rods less than from tenant house A. With two trips a day this location would save 252 miles of walking in a year and perhaps $21 worth of time. The owner plans to move tenant house A to the location indicated as tenant house $A^1$. This location is surely sufficiently remote from the main farmstead.

On the farms included in this study, the average distance from tenant houses to their respective farmsteads was 72 rods. Assuming a minimum of two round trips daily, this distance means 324 miles of travel in a year. A distance of 20 rods would be much better.

Of the fifty-three farms studied, thirty-two had one or more tenant houses, the total number of houses being forty-five. Forty-two of the

forty-five tenant houses had gardens, the average size of garden being 0.3 acre (table 31). In addition to a garden, eighteen of the hired men were furnished potatoes from the farm crop. The size of gardens ranged from 0.1 acre to 1.2 acres. Where hired men are given large gardens they are

TABLE 31. Tenant Houses on Fifty-three New York Farms

| | Area occupied by 45 tenant houses (acres) | Average area occupied by each tenant house (acres) |
|---|---|---|
| Gardens | 13.28 | 0.30 |
| Orchards | 1.32 | 0.03 |
| Land occupied by buildings | 19.64 | 0.44 |
| Total area | 34.24 | 0.76 |

not usually furnished potatoes for winter use in addition. The area of land necessary to grow the potatoes furnished to the hired men was about 4.6 acres, or an average of 0.1 acre to each tenant house. Only two of the forty-five tenant houses had separate orchards for the hired man's use. On most farms the hired man is given such fruit as the farm produces, but does not have a separate orchard.

On most farms not enough attention has been paid to the location and arrangement of tenant houses. The house should, of course, be comfortable. The garden should be ample in size, usually from half an acre to an acre. Few hired men will leave a good garden in midsummer. A little care and attention in these matters will make for more efficient work and better-satisfied hired men. In times of labor shortage these considerations gain added importance.

## RELATION OF FARM LAYOUT TO OTHER FACTORS

The preceding discussions give some of the specifications for an ideal farm layout, but the layout of most farms is far from ideal. Farm layouts have developed, not according to a well-laid plan, but largely according to chance, and as a result they are not adapted to present conditions.

The farm plans included in these pages illustrate, in the main, all the undesirable features of farm layout and few of the good features. And yet these are the plans of prosperous farms, larger, better organized, and more profitable than the average New York farm. Some of these farms never were well arranged. Others were once well arranged, but changes in their area or in agricultural conditions have made them unsuited to present conditions. Only a few of them, indeed, are even reasonably well arranged to meet present conditions. It is therefore evident that the main problem of farm layout is the problem of rearranging farms to meet conditions of the present day and of the probable future.

On most New York farms it would not be possible to make an arrangement that would satisfy all the requirements of an ideal farm layout. There are natural limitations which prevent many farms from ever having even a moderately good layout. Perhaps the most important of these natural limitations is topography. Given fairly fertile land, its topography usually determines whether it shall be cropped or pastured. If it is too steep for machine operation, it must be pastured. In the hilly parts of New York it is necessary to crop all the land that is level enough. The field lines of such farms, therefore, follow the contour lines, and small, crooked fields are the usual result. Since topography cannot be altered, the shape and the size of fields on many farms are limited by this factor.

Soil differences limit the development of farm layout to some extent. It is preferable to have all the soil in one field fairly uniform. In most cases the differences in soil between adjoining fields are not great enough to make this factor important. Differences in drainage also are important in combining fields. All the land in a field should have uniform drainage, otherwise the whole field must wait for the wet land to dry. The drainage can be made uniform in many cases by tiling wet areas.

## How to plan a farm rearrangement and follow out the plan

In spite of natural limitations it is possible and practicable to greatly improve the layout on nearly all farms. There is no one particular layout to fit all cases. Every farm presents an individual problem which must be studied and considered separately.

The first step in planning a rearrangement is to study the farm and the conditions surrounding it. For this purpose it is well to have a map of

the farm. This need not be an engineer's map, accurately drawn to scale; a rough plan showing the relative sizes, shapes, and locations of the various fields will serve. The more accurate the map, the worse, usually, will it make the farm look. In addition to the map, it is necessary to have a thoro knowledge of the soil and drainage conditions, and of the topography of the different parts of the farm.

The second step in planning a rearrangement is to decide on the cropping plan or rotation that is to be followed. While it is not possible to follow a rigid crop rotation on most farms, it is advisable to follow a fairly definite cropping plan. Knowing the crops that are to be grown, the acreage needed for each, and the crop area, a cropping plan can be made which will satisfy these requirements. If two rotations are followed, two sets of fields, perhaps of different sizes, will be required.

After studying the farm and deciding on the system of farming and the crop rotation to be followed, plans should be made for the long-time development of the farm which will provide as good a layout as the natural limitations will permit. The plans should be developed slowly and the work should be done at odd times. The savings to be made are seldom large enough to pay the entire cost in one year. If properly planned, such work helps in the labor distribution by keeping the men profitably employed when there is little other work to be done. Small fields can gradually be combined into larger units without radical changes in the rotation. It is usually unnecessary and unwise to plow up a good new seeding in order to combine two fields; the same results might be accomplished in a year or two by repeating a crop on one of the fields, or by leaving down a piece of hay for another year.

In buying a farm the layout is worthy of careful consideration. Before buying, a map or rough plan of the fields should be made, indicating the area and the important natural features of each.

## ACTUAL REARRANGEMENTS OF SOME NEW YORK FARMS AS MADE BY OWNERS

While on most farms the rearrangement of the layout to meet conditions of the present day has received little attention, on some farms such changes have been and are being made. A few of these rearrangements are described in the following pages.

REARRANGEMENT OF TWO CENTRAL NEW YORK FARMS

*The first farm*

In figure 139 is shown the plan of three central New York farms as existing in 1914. These farms were owned at that time by one man but were

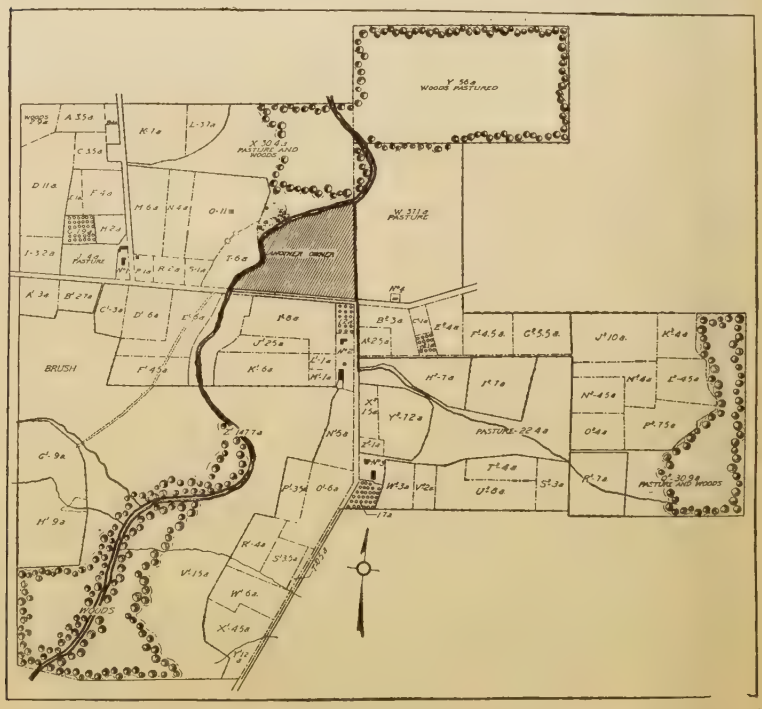


FIG. 139. PLAN OF THREE CENTRAL NEW YORK FARMS AS OPERATED IN 1914

The tillable land of these farms was divided into sixty-four small fields, averaging 4.3 acres each
Farm area, 646.4 acres
Average size of farmed fields, 4.3 acres

run as separate units, two being rented and the third being operated by the owner. The topography of the section is rolling, a considerable proportion of the farm areas being in untillable permanent pasture. The important crops grown are silage corn, cabbage, hay, oats, potatoes, and

buckwheat. Dairying is the most important enterprise. Milk, cabbage, hay, and buckwheat are the principal products sold.

These farms were excellent examples of patch farming, the tillable land being divided into sixty-four general crop fields averaging 4.3 acres each. On the three farms there were in 1914 a total of eight patches of corn, nine of oats, thirty-eight of hay, two of millet, two of cabbage, four of potatoes, and one of buckwheat. Some of these patches were farmed together when in hay, but the land had been plowed in the sixty-four fields shown on the map. There was no particular reason why these farms should be worked in such patches, except that they always had been farmed that way. Practically the only interior fences were the pasture fences, which were made irregular by natural conditions of topography and drainage. Fields $J^2$, $K^2$, $L^2$, $M^2$, $N^2$, $O^2$, and $P^2$ had never been manured, to the knowledge of the present owner. Fields $G^1$ and $H^1$ had been manured but once.

The field marked "Another owner," in the center of these farms, belongs to and is farmed by a farmer living more than a half mile away. The owner of this patch continues to farm this land at such a disadvantage, rather than trade it for a like area of land adjacent to his buildings, having refused such an offer from the former owner of these farms.

In the spring of 1915 these farms were purchased by their present owner, who was able to make only a small payment and gave a mortgage for the remainder of the purchase price. He worked the entire area as one farm, but he used all the farmsteads. Farmstead 2 was the real center of farm operation because it was the one most centrally located. The cows were kept here and the house was occupied by one hired man. The house at farmstead 1 was occupied by the owner, who kept his team and some young stock in the adjoining barns. The house at farmstead 3 was occupied by another hired man, who kept his team in the barn adjoining. The fourth house was used for the other regular hired man. By this plan of operation some of the disadvantages of the large area were overcome. Each worker had his team convenient to his house, and, when choice was possible, worked in the fields that were the most convenient. All the men helped with the milking at the main farmstead, but the young stock were located at one of the other two barns. Hay for sale was drawn to the most convenient barn. Oats were threshed from the two barns where the straw was needed.

Before starting spring plowing the first year, the new owner had decided on a plan of rearrangement and had the work on it well under way. The

development of the plan has been progressing slowly each year up to the present time. The plan of the farm in 1917 is shown in figure 140. As shown by this map, there are now twelve crop fields averaging 23.4 acres

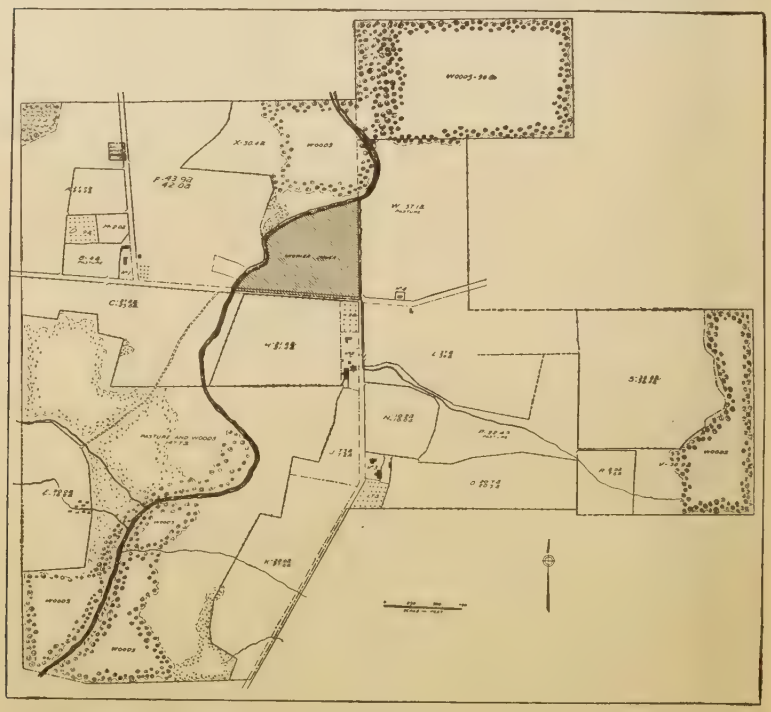

Fig. 140. The farm shown in figure 139, after rearrangement

The change from sixty-four small crop fields to twelve large crop fields required the removal of less than 300 rods of fence

Farm area, 646.4 acres
Average size of farmed fields, 23.4 acres
Average distance to farmed fields, 117 rods

each, instead of sixty-four fields of 4.3 acres each. These changes have involved little expense and have necessitated the removal of but few fences. Seven fields were combined to form field S, of 38 acres, without taking out a fence. Five fields were combined to form field H, also without removing

a fence. Ten fields have been combined to form fields J and K, and these will later be farmed as one field. Nine fields have been combined to form field F, 42 acres, by taking out 60 rods of barbed wire fence. Six fields have been combined to form field C by taking out 40 rods of barbed wire fence. Seven fields have been combined to form field A, which is farmed in two parts. When opportunity offers, the stone line inclosing 5 acres of this field will be removed and the 26 acres will be farmed as one field. Nine fields have been combined to form field L by clearing an acre of worthless orchard, taking down 30 rods of rail fence, and removing 65 rods of stone fence. This stone fence and the two large stone piles formerly in field T were removed without charge, in return for the providing of a site for a stone crusher which crushed the stone for the construction of a county road thru the farm. The remaining 40 rods of stone and brush fence projecting down into this field will be removed when opportunity offers. Three fields have been combined to form field N, and five to form field O, without any expense. In addition to these changes many trees have been removed from the crop fields for firewood.

The present plan of this farm is not an ideal layout. Many of the fields are irregular in shape and must always remain so because of topography. The shape of a 40-acre field is far less important, however, than the shape of a 4-acre field. There are some short rows in field F, but most of the rows in the field will be from 70 to 100 rods long. The changes thus far brought about have been made at small expense and have been paid for by the saving of labor made possible by larger fields. The owner has been heavily in debt and has not allowed work on improvements to interfere with more important work on crops. His most important job just now is paying for his farm, and nothing should be allowed to interfere with this.

The present arrangement of this farm can be improved materially in the future, when the owner's finances warrant the necessary outlay. The shape of fields F and C can be improved by reclaiming some of the adjoining pasture land. This will necessitate drainage and the clearing off of some stone. Fields J and K can be enlarged and improved in shape by adding some of the pasture land toward the creek. By tiling some of this pasture, it can be made the best crop land on the farm. Fields N and O will be combined by reclaiming some of the pasture P. Field L can never be made regular in shape because of natural conditions, but it may be improved somewhat by extending it toward field S and taking

in part of field P. Field E may be improved and enlarged by drainage, or it may be turned back into pasture. It is rather distant and is not especially good land. The corner of woods in field A will probably be cleared off and this area added to the crop land. The pastures also could be improved by the cutting of some timber. There is, however, plenty of pasture for the stock now kept, and this change would be one of the last to be made.

This farm is larger in area than most farms, but the same principles could have been worked out on a smaller scale on any one of the three farms of which it is composed. It illustrates very well what great improvements can frequently be made at slight expense, by good management.

*The second farm*

The original plan of the various parcels of land which have been combined into one central New York farm is shown in figure 141. The present area of the farm is 478 acres, and the land was purchased in nine different parcels from as many owners. Some of the persons from whom the present owner bought had already begun the work of combination, so that this farm represents fifteen different farms or parts of farms to the knowledge of the former owners. Except for parcels A and B, the topography of these farms is practically level. There are no physical reasons for the small, irregular fields. The principal crops grown are corn, oats, wheat, and hay.

Considering its topography, parcel B had a fairly good layout, the irregular boundaries of the fields being due largely to this factor. The crop land north of the pasture field 11 was divided into five fields for a five-years rotation. Fields 6 and 10 were cropped but should have been pastured. Both fields are extremely steep. Little stock was kept on this farm, the only field pastured being 11.

Parcel C was a level tract of 100 acres divided into twenty-four small, irregular fields. Except for the road and the woods, the whole farm might have been worked in one field, there being no physical obstacles to this. Fields 9 and 12 were the first fields cleared, evidently because they had drier, warmer soils than the remainder of the farm. They happened to be laid out diagonally to the farm boundaries, and this accident apparently determined the layout of the whole farm. For many years the farm was worked in these small, irregular fields, because it was easier in any one

year to do this than to remove the obstructions. Little stock was kept, and this was pastured on the best tillable land on the farm. The little manure produced was spread on the fields near the buildings. Fields 20,

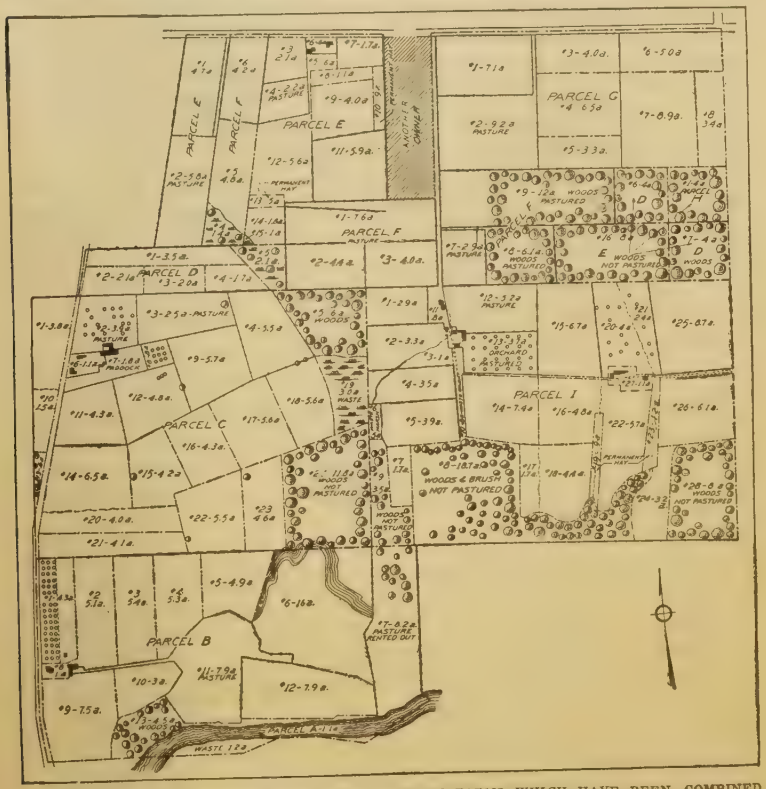


FIG. 141. PLAN OF FIFTEEN FARMS AND PARTS OF FARMS WHICH HAVE BEEN COMBINED INTO ONE FARM OF 477.8 ACRES

The crop land of these farms was divided into sixty-nine small, irregular fields, averaging 4.2 acres each. Except for a part of parcel B the land was practically level

21, 22, 23, 14, 15, and 18 had not been manured for at least eleven years. Fields 20 and 21 were formerly farmed as one field, as also were fields 22 and 23. Being divided one year by accident, they were farmed afterward

as separate fields. There were few fences, and the whole farm could have been rearranged with little trouble and expense.

Most of the land in parcels D, E, F, and H had originally been included in one farm, with the buildings as shown in parcel E. When the owner of this farm died without leaving a will, the land was divided by the court among the eight heirs, giving each a little piece of crop land and a little piece of woods. This division destroyed the value of the land for farming because each tract was too small. Some of the tracts had already been combined when purchased by the present owner.

Parcel G, a tract of 50 acres, was part of a larger farm. Parcel I had originally been two farms, with building centers as shown. This farm, which is practically level except in the southern part, was divided into twenty-eight small fields. There were several crooked hedgerows which caused irregular fields and wasted much land. Two small open ditches also helped to make the fields irregular.

In all there were one hundred and six fields in the land now occupied by this farm. Little stock was kept and there were few good fences. Some land was cropped which was good only for pasture, and some of the best tillable land was pastured. The woodlots occupied level tillable land except in the southern part of farm I, but contained little good timber. The crop land was divided into sixty-nine small, irregular fields, averaging 4.2 acres each.

In 1907 the present owner of this farm bought parcel B, subject to lease. Possession was not secured, therefore, until 1908. In the next two years a few changes were made in the arrangement of this farm. Fields 6 and 10, which were too steep to be farmed economically, were fenced and pastured. The brush in the pasture field 11 was cut, and some tile was laid in field 12. In 1910 parcel C was purchased, and this step entirely changed the plans of rearrangement. Before the rearrangement of these farms had progressed far, parcel I was bought, in 1912. The remainder of the present farm was purchased in 1914 and 1915.

The results of the work of ten years on the development of this farm layout are shown in the farm plan for 1918, figure 142. Instead of sixty-nine small, irregular crop fields, there are now five main crop fields averaging about 50 acres each, convenient to the buildings. To plow the sixty-nine crop fields of the old arrangement with a 14-inch plow would require about 20,000 turns at the ends of the field, while to plow the five

50-acre fields requires but 6000 turns. More important than the saving in turning by the farming of large fields is the gain in efficiency result-

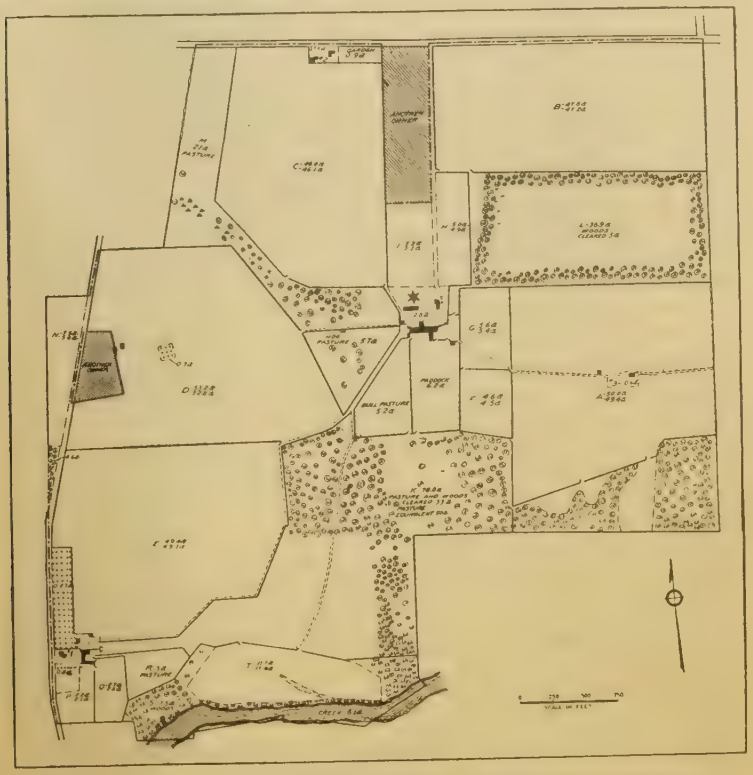

FIG. 142. THE FARM SHOWN IN FIGURE 141, AFTER REARRANGEMENT

Instead of sixty-nine small, irregular crop fields, there are now five main crop fields averaging 50 acres each, convenient to the buildings. The average distance to the farmed fields is 60 rods

Farm area, 477.8 acres
Average size of farmed fields, 28.5 acres
Average distance to farmed fields, 60 rods

ing from the driving of more horses to each man and the use of larger machines. Dragging is done with four horses instead of two. A four-horse drill has replaced the two-horse drills and a four-horse binder is

used. Larger fields permit the effective use of larger machines and more horses to the team, and thus greatly increase the efficiency of labor.

The present layout provides for a better utilization of land. About 6 acres have been added to the crop land by eliminating hedgerows and useless fences. The entire farm is now fenced but the fences occupy only 2.8 acres. About an acre was added to the crop land by tiling open ditches, while a much greater area which had previously been in permanent hay was thus made tillable. About 26 acres which had previously been lying idle in brush or swamp were made productive by including them in the pastures. In addition to this, 45 acres of woodland were added to the pasture area. Thirty-six acres of land which was too steep or too wet to be cultivated, but which had formerly been in crops, were added to the pasture land. In addition, 8 acres of poorer crop land were utilized in paddocks near the buildings. Fifty-two acres of the best land on the farm, which had formerly been pastured, were added to the crop land.

The arrangement of pastures in this layout is very convenient. Each of the main crop fields can be connected with a permanent pasture, and hence with water when temporarily pastured. The paddock of 6 acres south of the main farmstead forms a wide lane to the main pasture. There will certainly be no waste land in this lane. The small pastures for the bull and the hogs save much time. The other pastures are likewise so arranged as to open up near the buildings.

The four small crop fields, F, G, H, and I, are used for a rotation of beets, potatoes, and other minor crops. Field T has been kept in alfalfa most of the time. Field N is too distant to be worked to advantage and will probably be disposed of. It adjoins a larger field of another farm, shutting this field off from the highway. Fields P, Q, and R are used for stock kept at the adjacent farmstead. The houses designated as No. 2 and No. 3 are used as tenant houses for hired men.

Along with the fields, the buildings of these farms have likewise been rearranged to adapt them to present conditions. The main farmstead has been developed at the center of the farm convenient to the fields. A house and a few barns were already located here. By using these barns and the frames and lumber from the other barns scattered over the original farms, a well-planned centralized set of buildings has been developed. They have adequate storage capacity and are conveniently arranged for work.

Further changes will be made in the future. The woods will be cut from field L, and the land will be pastured until the stumps rot and will finally be added to the crop area. The southern part of field A is rather poor. When the present fence gives out, a new fence will probably be put thru from the east end, parallel to the farm boundary, thus adding a few acres to the pasture. To replace the area lost, fields F and G may be added to field A. One of the more distant tenant houses will probably be moved to a location near the main farmstead. This will save much useless walking.

The changes in this farm have been made more rapidly than would ordinarily be justified, but they have not interfered with the successful operation of the farm. The original small fields have been gradually combined into larger units without seriously interfering with crop production.

### REARRANGEMENT OF A NORTHERN NEW YORK FARM

The plan of a northern New York farm as existing in 1912 is shown in figure 143. This farm was rather long and narrow, with the buildings at

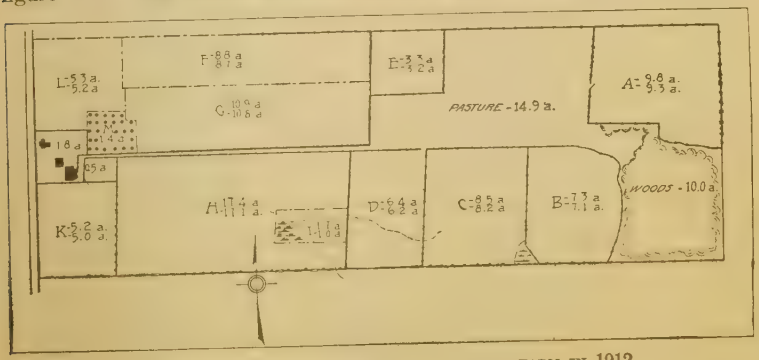


FIG. 143. PLAN OF A NORTHERN NEW YORK FARM IN 1912

Farm area, 116 acres
Average size of farmed fields, 7.4 acres
Average distance to farmed fields, 74 rods

one end. There were eleven farmed fields averaging 7.4 acres each, the average distance to the nearest corners of the fields being 74 rods.

The owner of the farm wanted more land, and in 1913 he purchased the 118-acre farm directly across the road, making a total farm area of 234

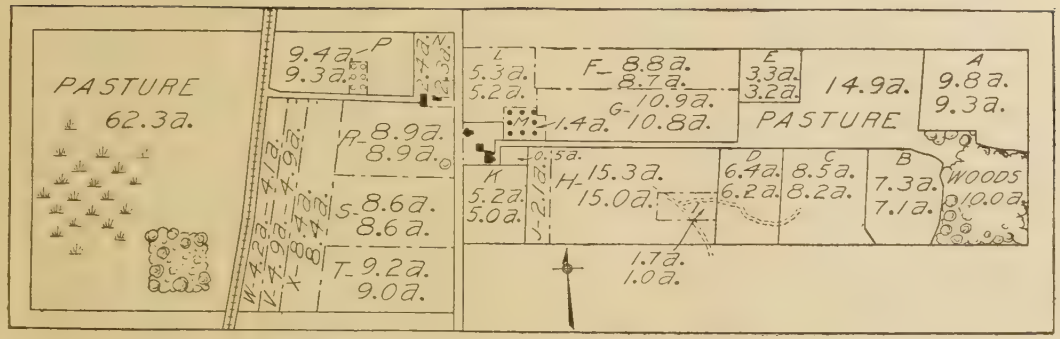


FIG. 144. THE FARM PLAN SHOWN IN FIGURE 143, IN 1913

In 1913 the 118-acre farm across the road was purchased, making the total farm area 234 acres. In this case the buildings were brought into the middle of the farm by buying the land across the road

Farm area, 235.3 acres
Average size of farmed fields, 7.1 acres
Average distance to farmed fields, 64 rods

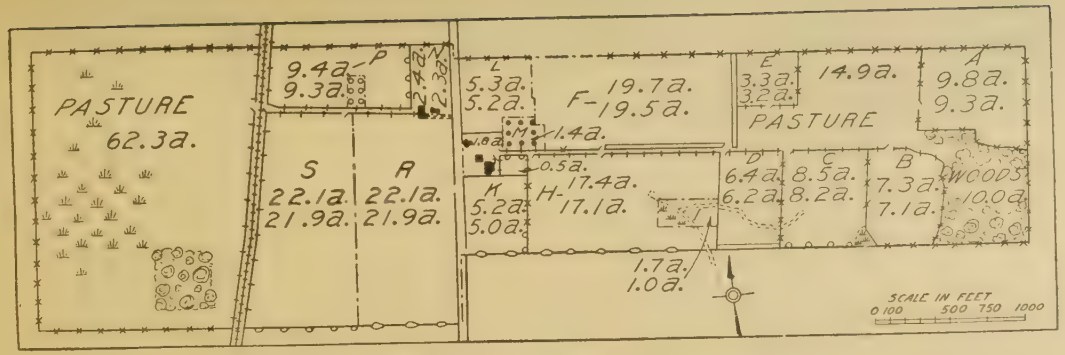


FIG. 145. THE SAME FARM IN 1917

Since 1913 the layout has been further improved by enlarging and combining some of the crop fields

Farm area, 235.3 acres
Average size of farmed fields, 10.5 acres

acres. The crop land of the new farm was more convenient for farming than the land on the original farm. Altho the farm was doubled in size by the purchase, the average distance traveled to fields was actually decreased from 74 rods to 64 rods. The plan of the two farms is shown in figure 144.

By this combination two small farms, either one of which was too small to furnish a satisfactory living with the type of farming made necessary by soil and other conditions, were combined into one farm large enough to be operated successfully and economically. The large area of pasture on the newly purchased farm was needed for keeping a good-sized herd of cows. It was easily reached by the lane and a cattle-pass under the railroad. The other house was used for a hired man, and the other barn for young stock.

Since 1913 many of the fields have been combined and enlarged. The plan of the farm as it existed in 1917 is shown in figure 145. There are four main fields — F, H, R, and S — of good size and shape, and several smaller fields. The small fields A, B, C, D, and E are pastured in rotation. The soil is very sandy and does not hold grass well. The changes that have been made in the field arrangement did not require the moving of a single fence. All that was needed was a little care and thought in planning crops so that the fields could be combined. There is still opportunity for further improvement in the layout.

This plan shows one example of locating the buildings in the middle of the farm by buying the land across the road. Not only was the layout improved by this means, but one successful farm was made of two unprofitable ones.

### REARRANGEMENT OF A WESTERN NEW YORK FARM

The plan of a western New York farm as it existed in 1910 is shown in figure 146. The farm is located in a general farming region where little stock is kept. Two cows were kept on the farm for home use. There was no other stock except horses. Apples, peaches, potatoes, cabbage, and wheat are grown for sale in this section, also corn, hay, and some oats for farm use. The topography is gently rolling and nearly all of the land is tillable. The soil varies in different parts of the farm, but in general it is a fine sandy loam.

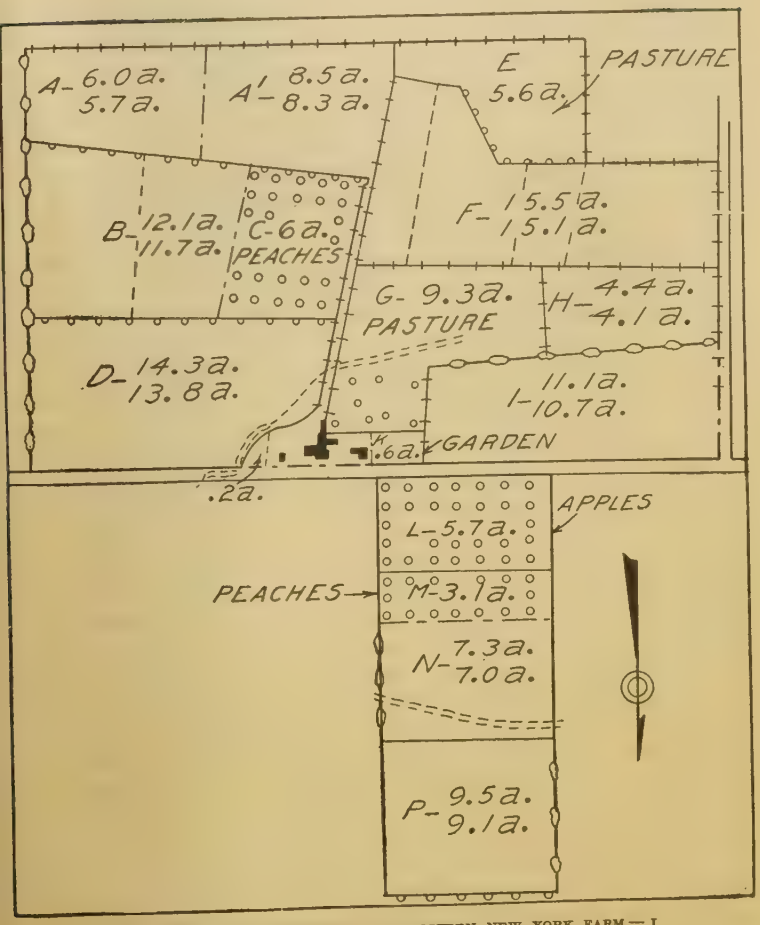


FIG. 146. REARRANGEMENT OF A WESTERN NEW YORK FARM — I
Plan in 1910, before rearrangement

This plan illustrates the chance way in which most farm arrangements have developed. Field E happened to be a wet piece of land and was therefore put into pasture. This made a lane necessary. The lane was run directly from the barn to the pasture, diagonal to the farm lines. A peach orchard was planted along the lane, with rows parallel to it, thus fixing its location permanently. Every field on the farm was irregular in shape, with a greater or less number of short rows. Even fields of fairly good size which could have been farmed in one piece were farmed in small patches; field F, for example, in 1912 was divided into four patches, of corn, potatoes, cabbage, and beans, respectively, with the rows running crosswise, as the field lines indicate. The fence lines were full of stone and brush and wasted much land. The brush and stone fence between fields H and I occupied a strip of land about 24 feet wide. The rail and stone fence between fields A and B occupied a strip of land 14 feet wide.

The farm was purchased by the present owner in the fall of 1912 and he began clearing up at once. After a careful study of conditions he planned a rearrangement, and began to work out his plan gradually, as opportunity permitted. In 1912, 40 rods of the old rail and stone fence between fields A and B was removed. In 1913, 2.5 acres of the pasture F (fig. 147) was added to the crop land of field H, a woven wire fence was built inclosing field F, and the old rail pasture fence was removed from field H. Also, a woven wire fence was built between the wet pasture I and the old orchard M. In 1913 and 1914, the two cross fences were cleared out of field K, which appears as the first field of the new layout, a rectangular field of 13.8 acres. About 100 loads of stone from these fences were drawn to the barnyard. In 1914 an old stone line was removed from field S. This permitted fields R and S to be farmed in two fields, instead of three as theretofore. Other minor changes made in 1914 were the removal of the road fence of field K, the completion of the lane fence, and the removal of the stone and brush fence between fields J and L. Field G was put in alfalfa to save farming the short rows caused by the lane along the side.

The plan of the farm in 1915, now beginning to take shape, is shown in figure 148. In the spring of 1915, the rail fence north of field C, running across fields A and C, was removed. Apple trees were set out in field I. The fence between fields E and H was cleared away, as well as the fence south of field C. There were 30 loads of stone in these fences. A start was made also in removing the stone wall south of field L. Perhaps the most important work done in that year was the rearrangement of the farm buildings.

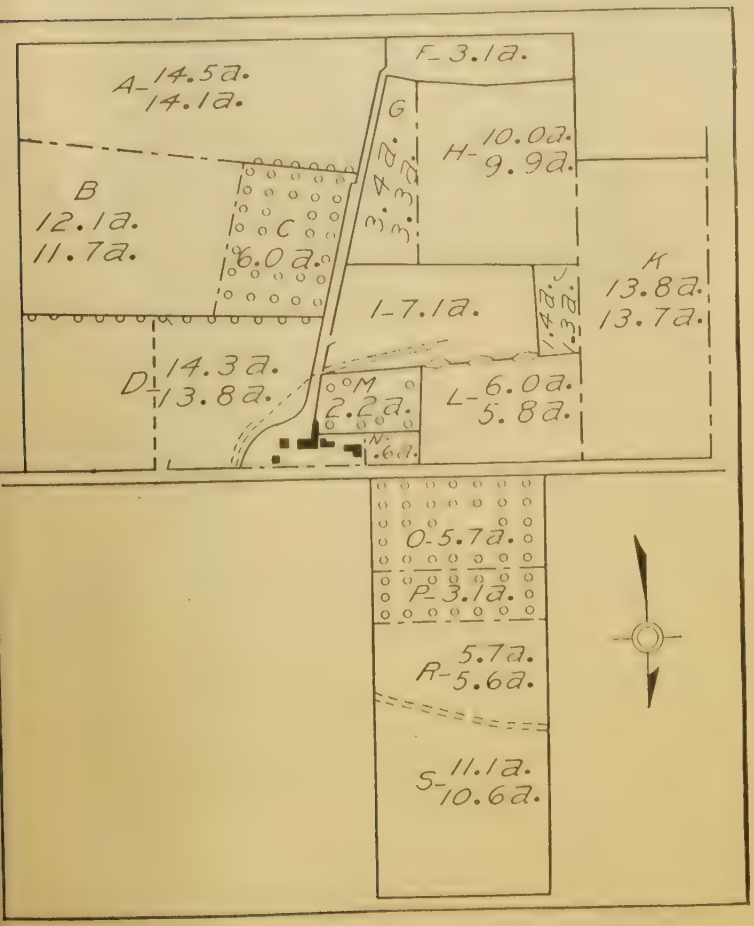


FIG. 147. REARRANGEMENT OF A WESTERN NEW YORK FARM — II

Farm plan in 1914. Some old fences have been removed and field K appears as the first field of the rearrangement

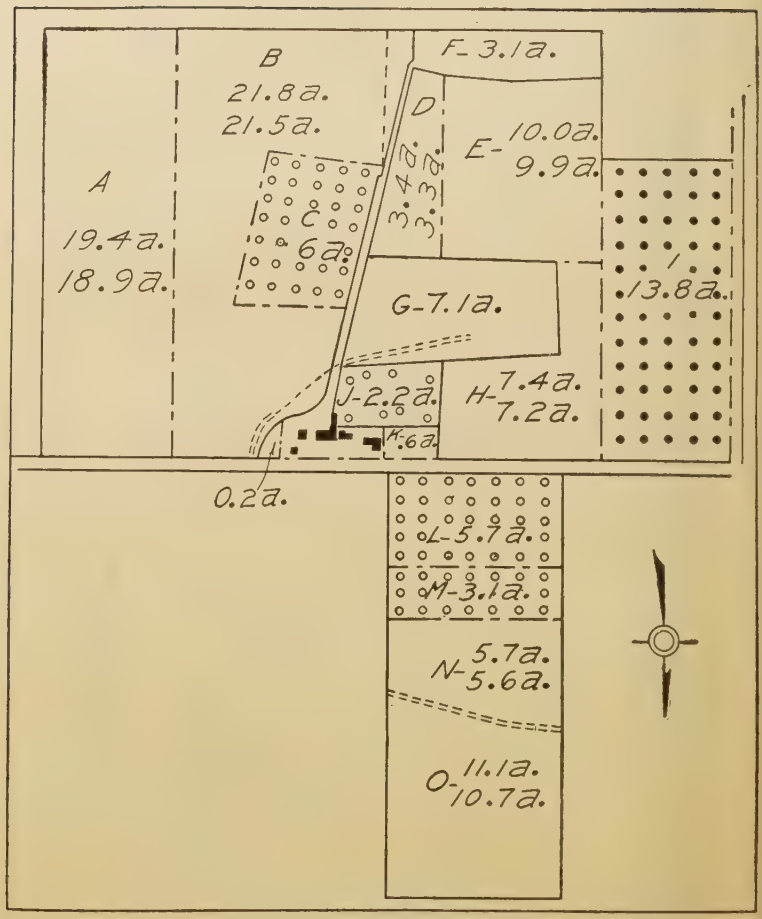


FIG. 148. REARRANGEMENT OF A WESTERN NEW YORK FARM — III

Farm plan in 1915. More fences have been removed and fields A and B begin to take shape. The farm buildings were rearranged in 1915

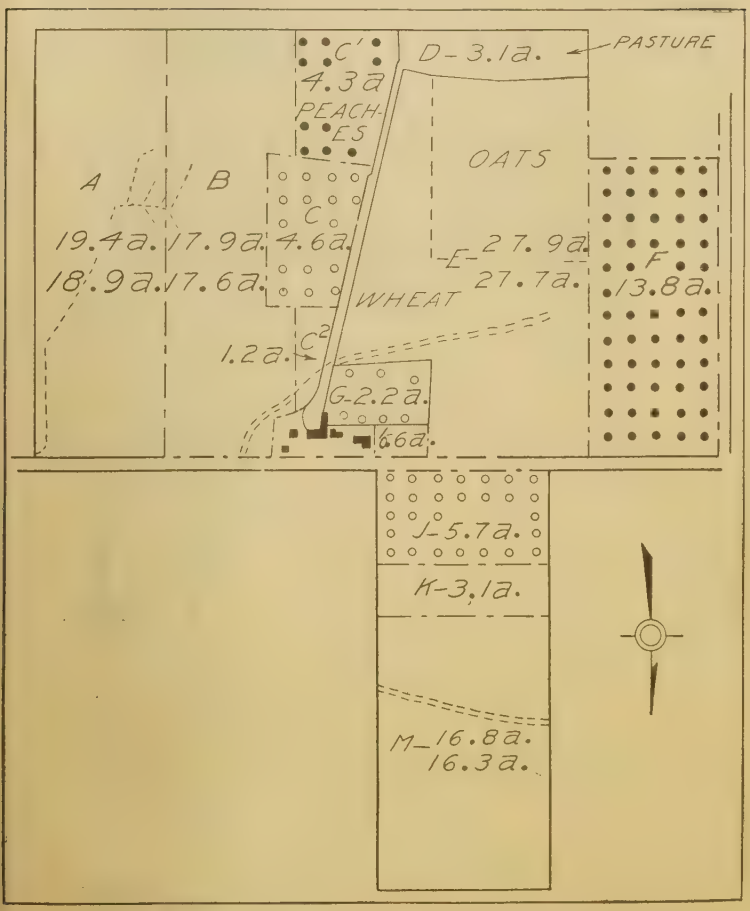


Fig. 149. Rearrangement of a Western New York Farm — IV

Farm plan in 1918

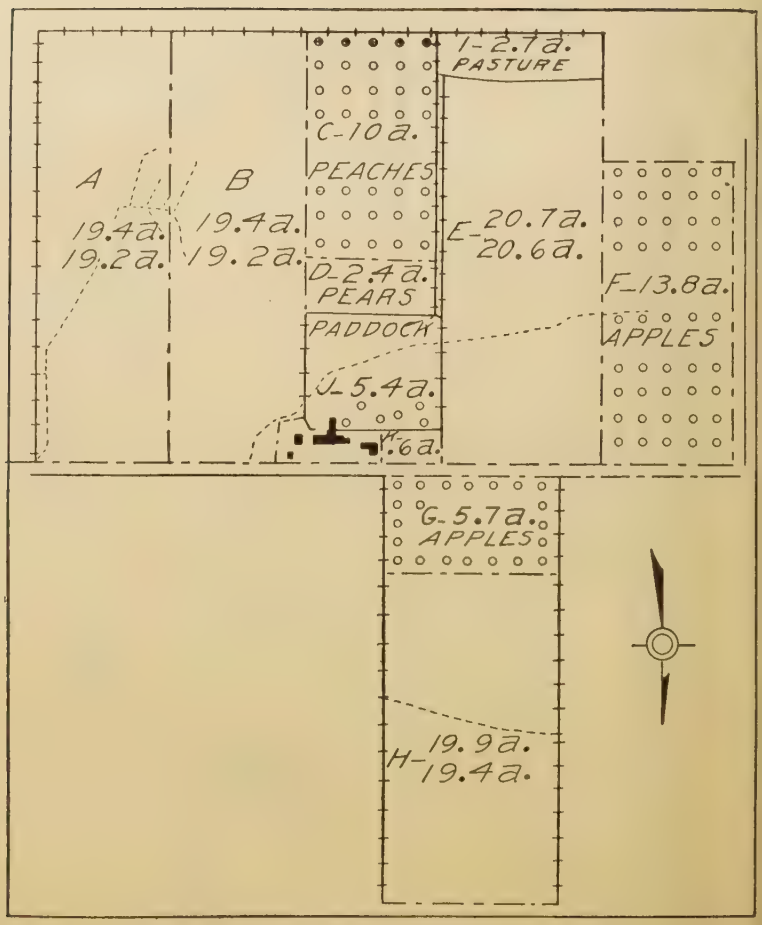


FIG. 150. REARRANGEMENT OF A WESTERN NEW YORK FARM—V. FINAL PLAN

Instead of small, irregular fields, as in the original plan, there will be four large rectangular fields of about 20 acres each and averaging nearly 100 rods long. About 10 acres of crop land has been gained. Much more important than this, however, is the saving of labor made possible by improving the size and shape of the fields

Farm area, 125.4 acres

The next step in the development of this rearrangement, the farm plan in 1918, is shown in figure 149. The remainder of the stone wall south of field J was drawn to the barnyard in the spring of 1916. There were about 150 loads of stone. The stone fence along the north end of field B, about 50 loads of stone, was cleared away during 1916 and 1917. Twenty rods of the stone fence north of field E was cleared away in 1917, and the line fence along fields E and F was removed. The old 7-acre pasture south of the old orchard G was cleared, and was sowed to wheat with the remainder of field E in the fall of 1917. Thirty-five loads of stone were removed from the fence along the north side of this pasture. A line of tile with some laterals was laid in field A to drain the low area in the middle of this field. In the spring of 1918, 4.3 acres of peach trees were set out in field $C^1$ to fill up the short rows south of the old peach orchard C. Since the trees on the east side of this orchard were deteriorating, 1.4 acres of them were pulled and the area cleared was added to field B. The peach trees in field K had become worthless. This field was pastured in 1918 and the trees were pulled in the late fall.

The owner's final plan for the rearrangement of his farm is shown in figure 150. The general crop land will be divided into four rectangular fields of about 20 acres each. Two of these fields are 100 rods long, and field H, which is the shortest, is 80 rods long. In addition to the general crops there will be about 20 acres of apples, 10 acres of peaches, and 2.4 acres of pears. The former diagonal lane will be replaced by the lane shown, running from the corner of the paddock J. The open ditches thru fields H and E will be tiled. Finally, the owner plans to clear up the stone and brush in the line fences with the help of his neighbors. These fences will then be replaced by woven wire or the areas will be left unfenced, as circumstances determine.

Probably about ten years will be required to rearrange this farm layout. The work done thus far has been performed at odd times and has not interfered with the successful operation of the farm. The owner is making an excellent living from the farm, is enjoying life, and at the same time is constantly making his farm more valuable. If possible he will rent or buy about 20 additional acres of land for general crops, so that a five-years rotation can be followed.

The contrast between the original and the ultimate layout of this farm shows plainly the advantages of the rearrangement. Instead of nine fields farmed in fourteen irregular patches of an average size of 6.2 acres

each, there will be four rectangular crop fields averaging 19.6 acres each. About 10 acres of crop land has been gained, 3 acres by clearing fence rows and 7 acres from pasture. Crop land is worth $125 an acre. More important than the land gained, however, is the saving in labor made possible by improving the size and shape of the fields.

## POSSIBLE REARRANGEMENTS OF SOME NEW YORK FARMS

While comprehensive rearrangements such as the preceding have been worked out on comparatively few farms, a growing number of farmers are beginning to plan some improvements of their farm layouts. In making such improvements it is important to have a fairly definite scheme of rearrangement in mind. As time goes on and the work proceeds, the details of the plan will probably be changed many times. Much thought, much time, and a great deal of work are required for the satisfactory execution of such a plan, but the results should be worth while.

In the following pages a few examples are given of possible rearrangements of farms. Considering all farm conditions an attempt has been made to plan a satisfactory layout for each. The rearrangements suggested are not the only ones possible, and probably are not the best possible, but they offer an improvement over present conditions.

## POSSIBLE REARRANGEMENT OF TWO CENTRAL NEW YORK FARMS

### *The first farm*

The plan of a central New York farm of 126 acres is shown in figure 151. Most of the land is tillable and in crops. The topography is rolling, but not steep enough to interfere with the use of machinery. The principal crops grown are silage corn, corn for grain, potatoes, oats, wheat, hay, apples, and alfalfa. Potatoes, wheat, apples, milk, and some hay are sold. A small herd of from eight to ten cows is kept. The soil is light enough to be worked easily, but grows good grain and hay. In general, a four-years rotation, of corn and potatoes, oats, wheat, hay, is followed. Occasionally the hay is left down for more than one year.

The present layout of this farm as shown on the map is much better than that of most farms. The fields are of fair size, most of them are regular in shape, and they are convenient to the buildings. The farm is made up of three parts, fields H and I from one farm, and field J from another, having been added to the original farm by the present owner.

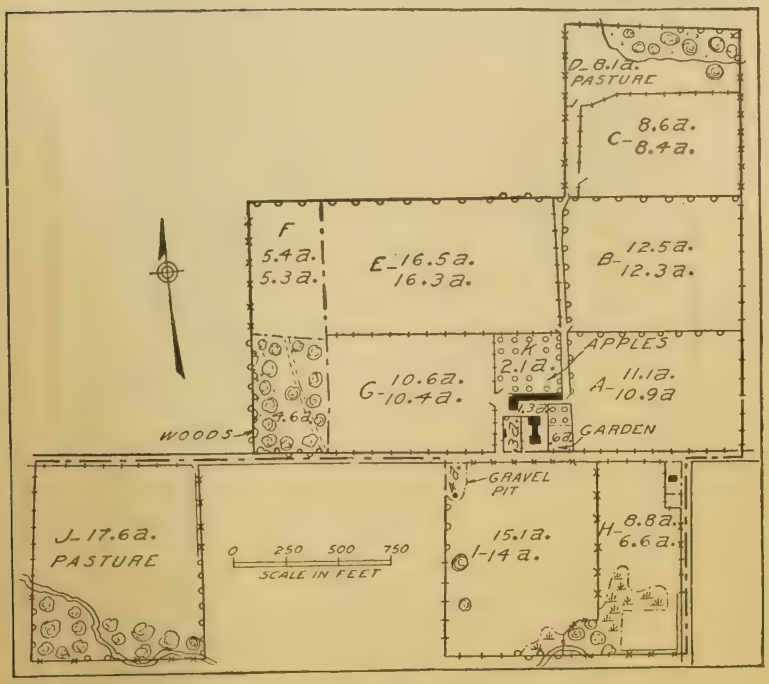


FIG. 151. PLAN OF A CENTRAL NEW YORK FARM IN 1915

Farm area, 126.3 acres
Average size of farmed fields, 10.5 acres
Average distance to farmed fields, 32 rods

Since there are eight fields and a four-years rotation is followed, the fields have been farmed in pairs, as follows: A and C, B and G, E and F, and H and I. Field H has been pastured a part of the time because of the swampy

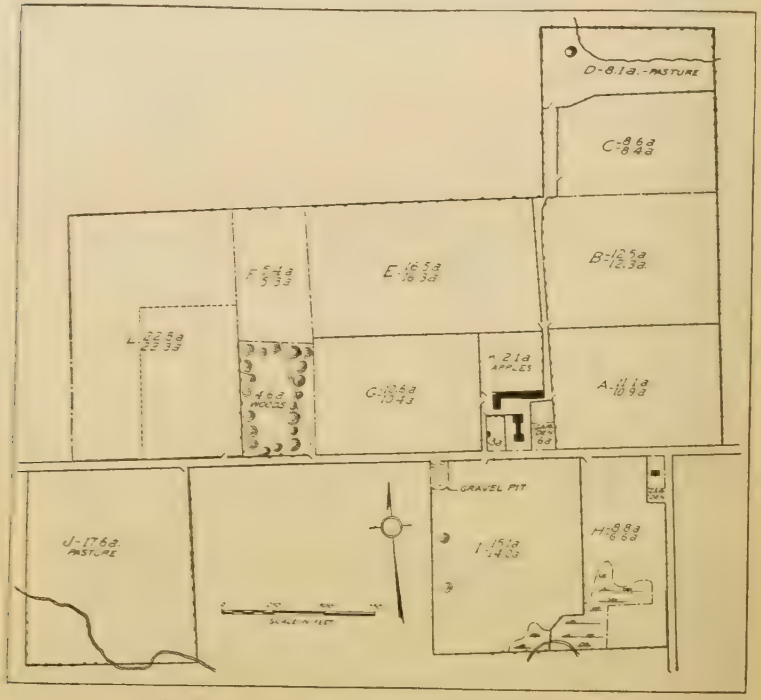


FIG. 152. PLAN IN 1917 OF FARM SHOWN IN FIGURE 151

The land appearing as field L on this plan formerly belonged to a farmer who lived three-quarters of a mile away. In the spring of 1917 it was added to this farm

Farm area, 149.4 acres
Average size of farmed fields, 10.6 acres

spot in the lower side, which cannot be easily drained. The cows are driven down the highway to the pasture J, a distance of about 100 rods.

More land was needed, and, having a good opportunity, the owner purchased a tract of about 24 acres on the west side of his former holding, in the spring of 1917 (fig. 152). This land belonged to a farmer

who lived three-quarters of a mile away, and had been worked under this disadvantage for many years. Being located far from the buildings, this land had received no manure and but little care. The land was run down and the fence rows were full of brush and stones. It was evidently

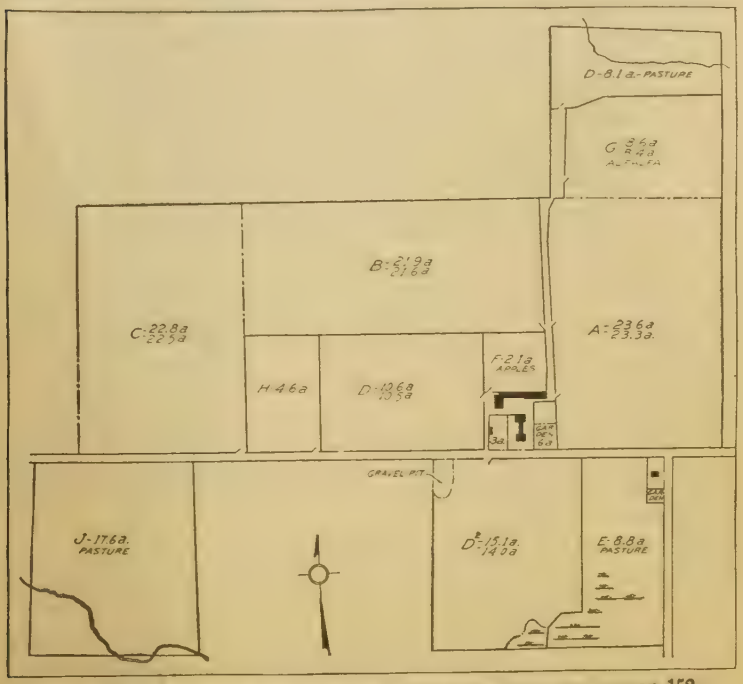


FIG. 153. A POSSIBLE REARRANGEMENT OF THE FARM SHOWN IN FIGURE 152

Few changes would be required to enlarge and combine the fields as suggested

Farm area, 149.4 acres
Average size of farmed fields, 16.7 acres
Average distance to farmed fields, 38 rods

worth much more as a part of an adjoining farm than as a part of a farm nearly a mile away, and the change in ownership finally took place.

A good plan of rearrangement for the present farm is shown in figure 153. The necessary changes are relatively few and could be made in a few years. Fields A and B of the present plan would be combined to make the new

field A. This would involve only the removal of the woven wire fence between the two fields. The present field C is labeled G in the new plan and would be kept in alfalfa. The present fields E and F would become the new field B. The new field C is the land last purchased. An unnecessary rail fence between the new fields B and C has already been removed. The lower part of the west boundary of the new field C was formed by a brush and stone fence row which wasted a strip of land more than a rod wide. The brush ranged in size from small brush to trees 8 inches in diameter, and there were about 20 loads of stone. To clear up and plow this 36 rods of hedgerow required about 90 hours of man labor and 45 hours of horse labor. At 25 cents an hour for man labor and 40 cents for a team, the cost of this work would be \$31.50, or 87½ cents a rod. A quarter of an acre of land was reclaimed, worth from \$20 to \$25, and thus the net cost of removing the obstruction was low.

Fields $D^1$ and $D^2$ would be farmed together to make the fourth field of the new layout. The present 4.6-acre woodlot occupies level tillable land which would be worth \$100 an acre if cleared. It contains practically no timber but the trees are being cut for firewood for home use and for sale. It is planned to cut off all the wood in about five years, approximately a fifth having been cut during the winter of 1917-18. After the timber is cut, this stump lot will be cleared for cropping as soon as possible. Since there is no water supply it cannot be conveniently pastured while the stumps are rotting.

The proposed layout has five large fields which are to be farmed as four, averaging 23 acres each, besides one field for alfalfa. Eventually the stump lot H will be cleared and added to the crop area.

The owner of this farm is looking ahead still further. It will probably be possible in a few years to buy the 24-acre field which lies between the present fields I and J. This lot is farmed at great inconvenience by a man who lives a mile away. It is worth much more to the man who lives across the road. If this land is acquired, the rearrangement shown in figure 154 will be made possible. This plan would provide for four fields of about 30 acres each, and 8 acres for alfalfa. The four main crop fields are of fairly good shape and all are convenient for working. Altho field C is nearly square, this is not a serious drawback in a field of 30 acres. The cost of the necessary changes would be small and the saving of labor would pay the entire expense in a few years. Five acres of crop land would

be gained, mostly from the woodlot. The value of this land would more than cover the cost of clearing.

On the east side of this farm is a small farm comprising 30 acres of rather poor land with poor buildings. Since the latter farm is too small to pro-

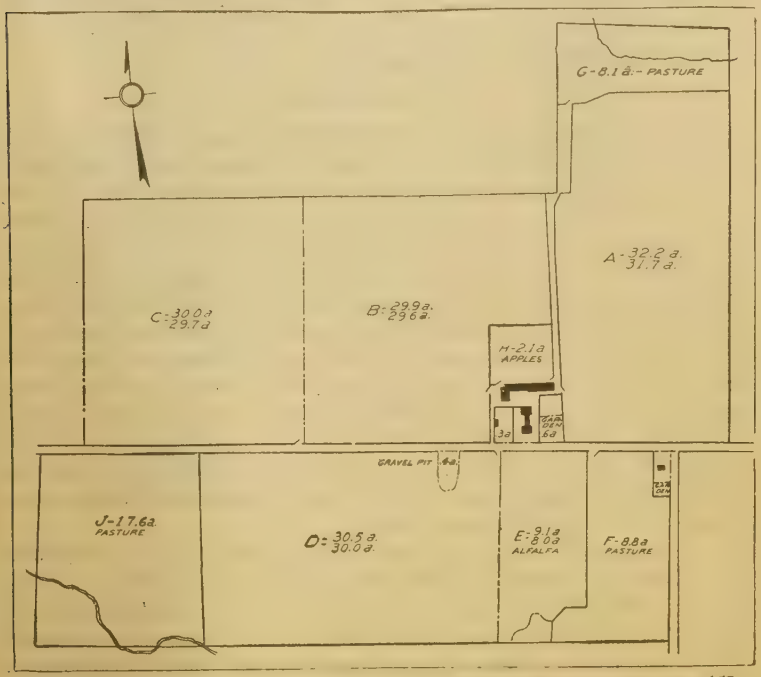


FIG. 154. ANOTHER POSSIBLE REARRANGMENT OF THE FARM SHOWN IN FIGURE 152

The land shown as field D in this plan belongs to a farmer who lives a mile away, and is thus worked at a great disadvantage. The land is worth more to the owner of this farm, and if it were acquired by him the farm might be rearranged as suggested. Four long crop fields are provided for a four-years rotation, and in addition there is a small field for alfalfa.

Farm area, 173.4 acres
Average size of farmed fields, 25.8 acres
Average distance to farmed fields, 30 rods

duce a satisfactory living, it will probably be for sale in a few years. If it can be purchased reasonably, this land will be added to the farm under consideration, for pasture. Since it adjoins the small pasture at the north end of the farm, it would make a valuable addition to the pasture land.

In such a case the pasture J could be used for dry stock and the cows would not have to be driven daily down the road to pasture.

Neither of these suggested rearrangements may ever be entirely realized. Changing conditions may make some other arrangement more desirable or a better plan may become possible. By planning for the future development of his farm, however, this farmer will be ready to take advantage of every opportunity for furthering his plan.

*The second farm*

The plan of another farm in central New York as it existed in 1915 is shown in figure 155. The soil is very heavy but most of the land is tillable. The topography is rolling. The principal crops grown are silage corn, oats, barley, wheat, hay, and alfalfa. A large dairy herd is kept, the pasture being supplemented by the feeding of silage and alfalfa in summer. This farm is made up of parts of four 50-acre farms, the history of which has already been given (page 398). As shown by the map, the farm was divided into sixteen crop fields, most of these being small in size and irregular in shape. In many of these fields the irregularity in shape was caused by the long open ditch which passed thru part of the farm. The ditch occupied more than an acre of land and necessitated more than two hundred short rows. The 50-acre tract on which the ditch was located was formerly a separate farm, with the farmstead located as shown, near the orchard R. The house was used by the present owner for a tenant house, altho it was very inconveniently located.

More land was needed, and in the spring of 1918 the intervening farm of 54 acres was purchased. This farm had been unprofitable for years because it was too small and was poorly farmed. The land had received no manure and was badly run down. The present layout of the combined farms is shown in figure 156. Some changes have been made in the original farm since 1915. Most of the open ditch has been tiled and the land formerly occupied by the ditch has been cleared for crops. Some of the fields have been enlarged and combined. Some old apple trees have been cleared out of field N. The pasture field B has been plowed and is being temporarily cropped, and the former night pasture, field I on the 1915 plan, has been added to field E.

A possible rearrangement for this farm as now constituted is shown in figure 157. While far from ideal, this plan satisfies the requirements and yet considers the natural features of the farm. A five- or six-years rota-

tion is followed, of silage corn, oats or barley, wheat, hay for two or three years. In addition a considerable area of alfalfa is grown. The

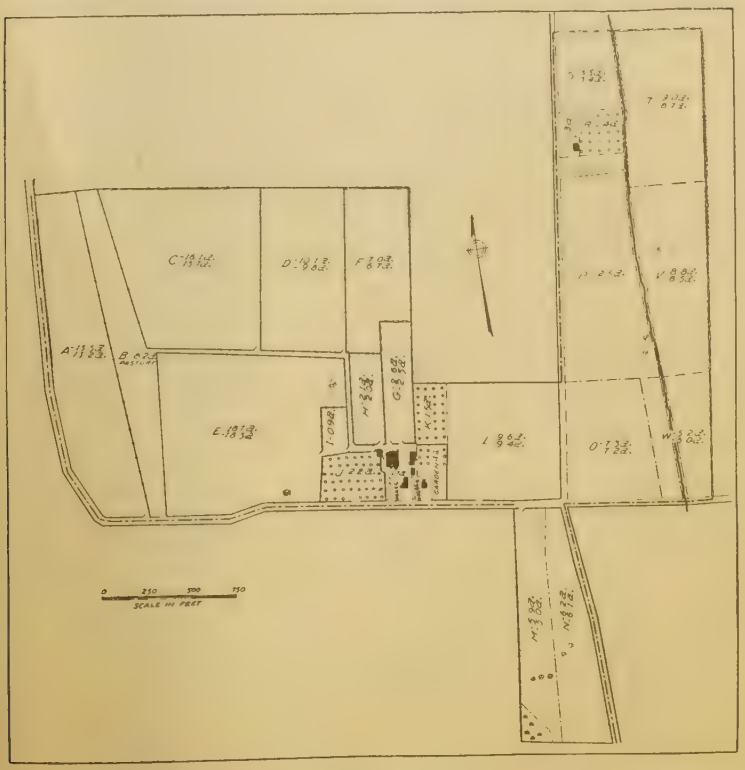


Fig. 155. Plan of a central New York farm in 1915

As is here shown, this farm was made up of three original 50-acre farms and part of a fourth farm

Farm area, 162 acres
Average size of farmed fields, 8.4 acres
Average distance to farmed fields, 80 rods

rearrangement provides for six main crop fields of from 24 to 29 acres each, and several fields for alfalfa. The fields are reasonably convenient to the buildings and are as regular in shape as the shape of the farm will

allow. In this case it is impossible to buy land across the road to put the buildings in the center of the farm.

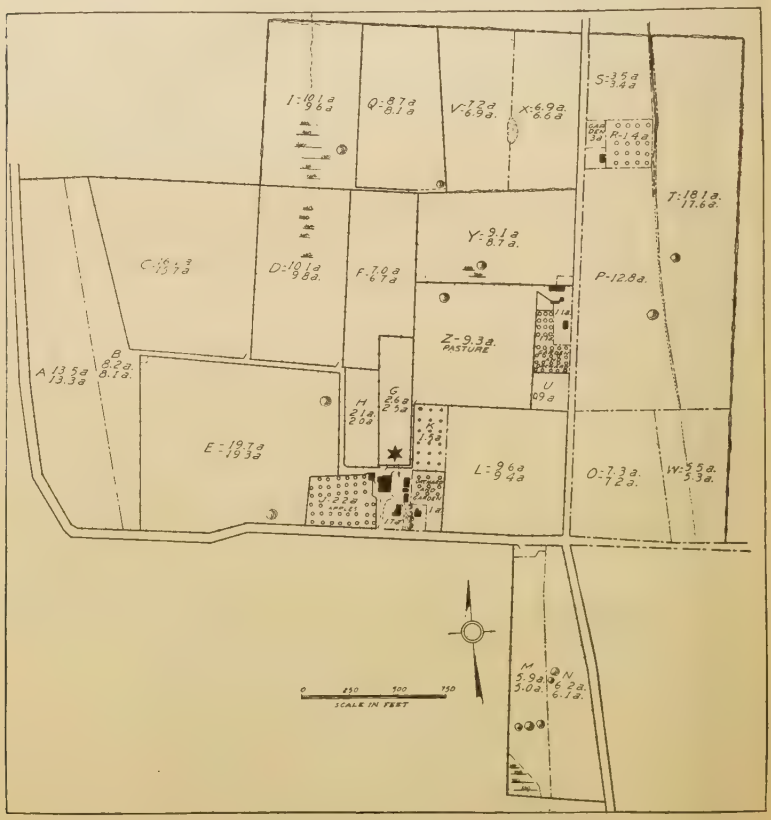


FIG. 156. PLAN IN 1918 OF FARM SHOWN IN FIGURE 155

In the spring of 1918 the intervening farm of 54 acres was added to the farm shown in figure 155, increasing the area to 216 acres. Some improvements in the former layout have already been made, the most important being the tiling of the open ditch between fields P and T

Farm area, 216.5 acres
Average size of farmed fields, 9.2 acres

Field A of the new plan would be made up of two parts farmed together, A being the present field C, and $A^2$ being formed from parts of fields V

and X. A would be made square by running the west side out to take in a little of the hill pasture. Field B of the rearrangement would be made

FIG. 157. A POSSIBLE REARRANGEMENT OF THE FARM SHOWN IN FIGURE 156

Five large fields are provided for a five-years rotation, and three fields too rough to be cultivated are left for alfalfa. While far from ideal, this layout represents a great improvement over the former plan and yet meets the peculiar soil and topographical conditions of the farm

Farm area, 216.5 acres
Average size of farmed fields, 19.3 acres

up of the present fields D, H, and I, together with parts of fields F and Q. The new field C, made up of the two parts $C^1$ and $C^2$ to be farmed together,

would include the present fields E and M. The new fields D and E would be rectangular fields 160 rods long, made up of the present fields O, P, R, S, T, and W. The new field F would be made up of parts of the present fields U, Y, Z, and L.

Fields D and I of the present plan have been nearly useless for years because they are too wet. Buckwheat has been grown in field D in dry years, and some swale hay has been cut from field I. For practical purposes, however, they have been nonproductive land. In former years field D could not be drained alone because the only possible outlet was north thru field I and the owner of that field would not cooperate in putting a tile thru his own field. Since both fields are now owned by the same man, they can be easily drained by a few lines of tile. Most of this tile is already laid, and when the drain is completed the land will be the best on the farm.

The irregular area of night pasture as planned would include a strip of heavy clay soil which cannot be profitably tilled. Fields G, H, and I of the new plan would be kept in alfalfa continuously. This land is too rough to be cultivated to advantage, but it will grow alfalfa.

The tenant house at present located near the orchard R would be moved nearer to the main farmstead as shown. The worthless apple orchard R would be cleared off, and the remainder of the ditch in this field would be tiled so that this area of nearly 50 acres could be worked in two oblong fields.

This rearrangement, while far from ideal as stated above, represents an improvement over former conditions. Combining these farms has made possible the drainage of two formerly useless fields and has added 20 acres of good land to the crop area. The larger fields would result in greater efficiency of labor. No great expense is called for in the changes planned. They could be made in a few years, and the savings made possible should soon pay the cost of the changes.

### Possible rearrangement of a western New York farm

The plan of a western New York farm as it existed in 1915 is shown in figure 158. The topography is level. The principal crops grown are beans, wheat, hay, alfalfa, corn, oats, and barley. Most of the land is tillable and therefore there is little permanent pasture. In addition to a herd of two or three cows, a few sheep are kept, and either lambs or steers are fattened in the winter to use up bean pods and other roughage. In

1915 field K of the crop land was pastured, in addition to the small area of permanent pasture, field I.

The layout of this farm was fairly good considering natural obstacles. There were ten crop fields in 1915, averaging 8.8 acres each in size and reasonably convenient to the buildings. The irregular shape of the fields was caused by a large open ditch which drained a considerable area of the land. This farm was made up of three parts, as its outline indicates.

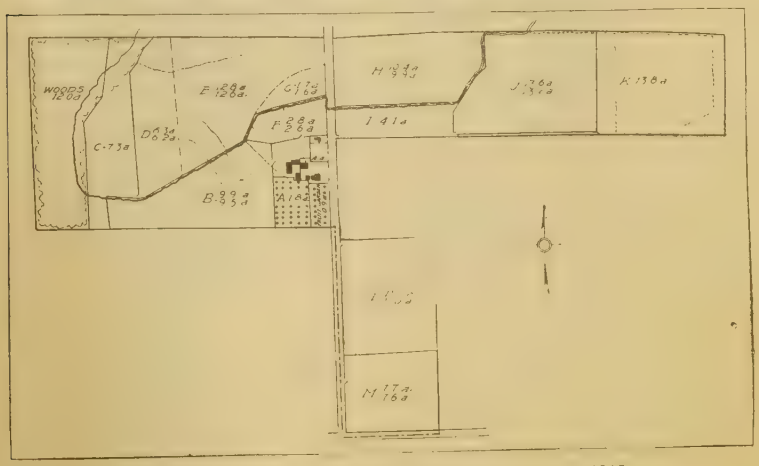


Fig. 158. Plan of a western New York farm in 1915

Farm area, 121.3 acres
Average size of farmed fields, 8.7 acres
Average distance to farmed fields, 60 rods

In 1916 the owner sold about 20 acres of his farm, and bought the run-down 90-acre farm adjoining his own on both sides of the road. The area sold comprised the fields L and M of the 1915 plan. These fields adjoined a neighbor's barn, and the owner was able to sell them to excellent advantage. They were bounded by a road on two sides, 7 per cent of their area thus being made untillable. The plan of the combined farms as they appeared in 1916 is shown in figure 159. The newly bought farm had been owned by an old man who had rented a considerable proportion of the land for several years. The farm was divided into eight rather small

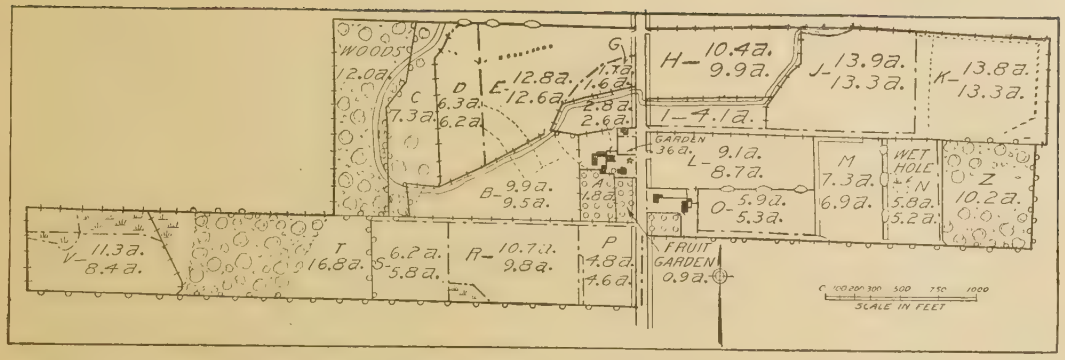


FIG. 159. PLAN IN 1916 OF FARM SHOWN IN FIGURE 158

In 1915 fields L and M of the plan shown in figure 158 were sold and the 90-acre farm adjoining the former farm on the south was purchased

Farm area, 193.1 acres
Average size of farmed fields, 7.4 acres
Average distance to farmed fields, 73 rods

crop fields, separated by wide hedgerows of brush and stone. The present owner has already begun the work of clearing up the farm and enlarging the fields. In 1917 the swamp hole in field R was tiled and the hedgerow between fields P and R was cleared out. By making these changes, fields P, R, and S were combined into one field of 21 acres, which was sowed to wheat in the fall. The fence between fields J and K has been taken out, and these fields will be farmed as one field of about 27 acres. Other changes will be made as rapidly as is possible without interfering with the farm work.

A possible rearrangement of this farm is shown in figure 160. This plan would provide for seven crop fields — three fields of about 27 acres each for the major rotation, three fields of 8 acres each for a minor rotation, and one field for alfalfa. The major rotation would be the common one in this region, consisting of beans, wheat, clover. The minor rotation would be silage corn, oats, wheat. In this section of the State, where little hay is needed for feed and other crops are more profitable for sale, there is a tendency to shorten rotations by omitting hay. Clover is seeded with wheat, but, instead of being cut, is plowed under in the spring for corn or potatoes. The advantage of the cropping system outlined is that corn silage wanted for feed will be grown in fields near the barn.

Field A in the proposed rearrangement would be formed by combining fields J and K of the present layout. Field B would be formed by combining fields L, M, N, and O. This would require clearing a considerable amount of brush and stone fence rows and would take some time. Possibly these stones might be disposed of for use on an improved road. Field C would be formed by combining the present fields P, R, and S, and taking in some of the tillable land in the adjoining pasture. The present crop field V, too wet and too remote for profitable farming, would be pastured or sold to the farmer near whose house it is located. The arrangement of fields D, E, and F is based on the assumption that the present open ditch can be tiled. The owner is planning to tile this ditch if it can be done without too great expense. The improvement in the shape of the fields, the elimination of the labor of keeping the ditch clear, and the saving of land, would be worth considerable effort and expense. If the ditch cannot be economically tiled, the shape of the fields of the minor rotation would not be so good but the proposed rearrangement would not be affected otherwise.

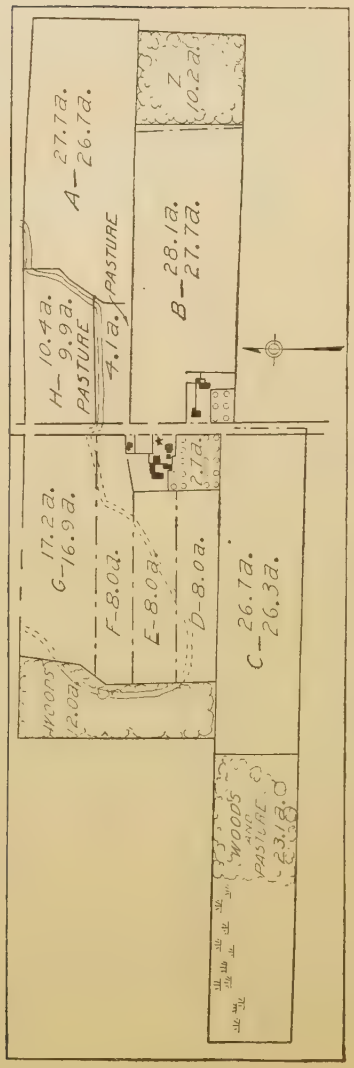


FIG. 160. A POSSIBLE REARRANGEMENT OF THE FARM SHOWN IN FIGURE 159

Farm area, 193.1 acres
Average size of farmed fields, 17.4 acres

The woodlot Z contains no valuable timber, and occupies level tillable land which will eventually be added to the crop land. Already a strip along the north side which shaded the adjoining crop fields has been cut. Crop land in this region is worth from $100 to $125 an acre.

By the changes suggested a good field arrangement would be secured in a few years. The changes already made have resulted in a great improvement. By selling off two of the more distant fields and buying land nearer to the buildings, the layout of two farms was improved. The buildings of the present farm are as near the center of the crop area as is possible with farms of this shape. The saving of labor and land made possible by the further improvement in arrangement as suggested, would in a few years pay the cost of making the changes.

## LAND UTILIZATION

A complete inventory of the land on the farms included in these studies is presented in table 32. The areas given under the different headings will not check in all cases with corresponding areas in previous pages.

TABLE 32. INVENTORY OF LAND ON FIFTY-THREE NEW YORK FARMS

| | Total number of acres | Number of acres per farm | Per cent of total farm area |
|---|---|---|---|
| Farmsteads: | | | |
| Home gardens | 15.98 | 0.30 | 0.17 |
| Home orchards: | | | |
| Apple | 40.54 | 0.76 | 0.44 |
| Mixed fruit | 2.90 | 0.05 | 0.03 |
| Total home orchards | 43.44 | 0.82 | 0.47 |
| Other farmstead crops | 2.63 | 0.05 | 0.03 |
| Paddocks | 12.69 | 0.24 | 0.14 |
| Land occupied by buildings, lawns, etc | 88.28 | 1.67 | 0.96 |
| Total farmsteads | 163.02 | 3.08 | 1.77 |
| Tenant houses: | | | |
| Gardens | 13.28 | 0.25 | 0.14 |
| Orchards | 1.32 | 0.02 | 0.01 |
| Land occupied by buildings | 19.64 | 0.37 | 0.21 |
| Total area tenant houses | 34.24 | 0.65 | 0.37 |

TABLE 32 (*continued*)

| | Total number of acres | Number of acres per farm | Per cent of total farm area |
|---|---|---|---|
| Public roads not in crops | 144.75 | 2.73 | 1.57 |
| Woodland not pastured: | | | |
| Tillable if cleared | 151.89 | 2.87 | 1.65 |
| Could be made tillable | 64.33 | 1.21 | 0.70 |
| Not tillable: | | | |
| Suitable for pasture | 22.30 | 0.42 | 0.24 |
| Suitable only for woodland | 22.58 | 0.43 | 0.25 |
| Total not tillable | 44.88 | 0.85 | 0.49 |
| Total woodland not pastured | 261.10 | 4.93 | 2.84 |
| Permanent pasture other than paddocks: | | | |
| Cleared pasture: | | | |
| Tillable: | | | |
| Lanes | 17.46 | 0.33 | 0.19 |
| Other land | 187.77 | 3.54 | 2.04 |
| Total tillable pasture | 205.23 | 3.87 | 2.23 |
| Could be made tillable: | | | |
| Lanes | 6.20 | 0.12 | 0.07 |
| Other land | 840.31 | 15.85 | 9.14 |
| Total cleared pasture which could be made tillable | 846.51 | 15.97 | 9.21 |
| Not tillable | 542.37 | 10.23 | 5.90 |
| Total cleared pasture | 1,594.11 | 30.08 | 17.34 |
| Woodland pastured: | | | |
| Tillable if cleared | 395.79 | 7.47 | 4.31 |
| Could be made tillable | 89.83 | 1.69 | 0.98 |
| Not tillable: | | | |
| Suitable for pasture | 297.09 | 5.61 | 3.23 |
| Suitable only for woodland | 98.78 | 1.86 | 1.07 |
| Total woodland pastured not tillable | 395.87 | 7.47 | 4.31 |
| Total woodland pastured | 881.49 | 16.63 | 9.59 |
| Total permanent pasture | 2,475.60 | 46.71 | 26.93 |

TABLE 32 (*continued*)

| | Total number of acres | Number of acres per farm | Per cent of total farm area |
|---|---|---|---|
| Land in cropped fields (other than gardens and farmstead crops): | | | |
| Land in cropped fields not producing a crop: | | | |
| Fence rows | 102.28 | 1.93 | 1.11 |
| Swampy land | 30.34 | 0.57 | 0.33 |
| Streams | 24.46 | 0.46 | 0.27 |
| Open ditches | 12.66 | 0.24 | 0.14 |
| Driveways in crop fields | 11.43 | 0.22 | 0.12 |
| Rough or steep land | 11.27 | 0.21 | 0.12 |
| Land shaded by woodlots | 6.68 | 0.13 | 0.07 |
| Trees in fields | 5.25 | 0.10 | 0.06 |
| Stone outcrops | 2.17 | 0.04 | 0.02 |
| Barns in fields | 2.15 | 0.04 | 0.02 |
| Stone piles | 1.42 | 0.03 | 0.02 |
| Total land in cropped fields not producing a crop | 210.11 | 3.96 | 2.29 |
| Land in cropped fields producing a crop: | | | |
| Crops other than fruit: | | | |
| Not rotated: | | | |
| Permanent meadow | 106.07 | 2.00 | 1.15 |
| Rotated: | | | |
| General crops | 4,413.87 | 83.28 | 48.02 |
| Truck crops | 88.38 | 1.67 | 0.96 |
| Rotated pasture | 645.85 | 12.19 | 7.03 |
| Total rotated | 5,148.10 | 97.13 | 56.01 |
| Total crops other than fruit | 5,254.17 | 99.14 | 57.17 |
| Fruit (other than home orchards): | | | |
| Apples: | | | |
| Bearing | 247.45 | 4.67 | 2.69 |
| Not bearing | 150.35 | 2.84 | 1.64 |
| Total apples | 397.80 | 7.51 | 4.33 |
| Peaches: | | | |
| Bearing | 37.53 | 0.71 | 0.41 |
| Not bearing | 16.17 | 0.31 | 0.18 |
| Total peaches | 53.70 | 1.01 | 0.58 |
| Pears: | | | |
| Bearing | 25.70 | 0.48 | 0.28 |
| Not bearing | 7.82 | 0.15 | 0.09 |
| Total pears | 33.52 | 0.63 | 0.36 |

TABLE 32 (*concluded*)

| | Total number of acres | Number of acres per farm | Per cent of total farm area |
|---|---|---|---|
| Land in cropped fields (other than gardens and farmstead crops) (*continued*): | | | |
| Land in cropped fields producing a crop (*continued*): | | | |
| Fruit (other than home orchards) (*continued*): | | | |
| Plums or prunes, bearing | 7.23 | 0.14 | 0.08 |
| Cherries: | | | |
| Bearing | 6.02 | 0.11 | 0.07 |
| Not bearing | 0.90 | 0.02 | 0.01 |
| Total cherries | 6.92 | 0.13 | 0.08 |
| Grapes: | | | |
| Bearing | 22.28 | 0.42 | 0.24 |
| Not bearing | 7.02 | 0.13 | 0.08 |
| Total grapes | 29.30 | 0.55 | 0.32 |
| Mixed fruits, bearing | 3.44 | 0.06 | 0.04 |
| Roadside apples: | | | |
| Bearing | 1.90 | 0.04 | 0.02 |
| Not bearing | 2.12 | 0.04 | 0.02 |
| Total roadside apples | 4.02 | 0.08 | 0.04 |
| Total fruit other than home orchards | 535.93 | 10.11 | 5.83 |
| Total crops (including fruit) | 5,790.10 | 109.25 | 63.00 |
| Total land in cropped fields (other than gardens and farmstead crops) | 6,000.21 | 113.21 | 65.28 |
| Other land: | | | |
| Lanes not included in pasture or cropped fields | 15.67 | 0.30 | 0.17 |
| Pasture land occupied by streams | 23.97 | 0.45 | 0.26 |
| Land other than pasture or crop land occupied by streams | 26.80 | 0.51 | 0.29 |
| Steep land not in cropped fields | 25.33 | 0.48 | 0.28 |
| Brushlot (waste) | 11.36 | 0.21 | 0.12 |
| Unused farmsteads | 5.01 | 0.09 | 0.05 |
| Village lots | 4.00 | 0.08 | 0.04 |
| Total other land | 112.14 | 2.12 | 1.22 |
| Total area of farms | 9,191.05 | 173.42 | 100.00 |

This is due to the fact that some classes of land have heretofore been included under two different classifications. For example, woodland pasture was included as woodland in table 27 (page 495) and also as pasture in table 25 (page 491). Home gardens and orchards were likewise included in the study of land in farmsteads and also in the study of land in crops. In table 32 there are no duplications.

A comparison of the present use of land on these farms with that on the average New York farm is given in table 33. Not only are the farms

TABLE 33. COMPARISON OF THE PRESENT USE OF LAND ON THE FARMS STUDIED, WITH THAT ON THE AVERAGE NEW YORK FARM

| | Number of acres per farm | | Per cent of total farm area | |
|---|---|---|---|---|
| | Average of 185,051 farms in 1918 census of New York | Average of 53 New York farms studied | 185,051 New York farms | 53 New York farms studied |
| Crops other than fruit | 45.61 | 94.17 | 44.21 | 54.30 |
| Fruit | 3.22 | 10.11 | 3.12 | 5.83 |
| All crops | 48.83 | 104.28 | 47.33 | 60.13 |
| Tillable pasture | 12.34 | 8.84 | 11.96 | 5.10 |
| Other cleared pasture | 12.96 | 26.21 | 12.56 | 15.11 |
| Total cleared pasture | 25.30 | 35.05 | 24.52 | 20.21 |
| Woods pastured | 11.55 | 16.63 | 11.20 | 9.59 |
| Total pasture | 36.86 | 51.68 | 35.73 | 29.80 |
| Woods not pastured | 10.81 | 4.93 | 10.48 | 2.84 |
| Farmsteads, roads, and lanes | 3.83 | 12.53 | 3 71 | 7 23 |
| Use not reported | 2.84 | ..... | 2.75 | ..... |
| Total farm area | 103.17 | 173.42 | 100.00 | 100.00 |

included in these studies much larger than the average, but they have a larger proportion of their land in crops and a smaller proportion in pasture than do the farms reporting in the last census of New York agriculture.[2]

[2] Census of the agricultural resources of New York. Census of 1917 taken by order of the New York State Food Supply Commission. Census of 1918 taken by order of the New York State Food Commission. 1919.

Sixty per cent of the area of these farms was in crops, as compared with 47 per cent for the State. About 30 per cent of the area of these farms was in pasture, as compared with nearly 36 per cent for the State. The proportion of the land in woods not pastured was much lower on the farms included in these studies, 2.84 per cent, as compared with 10.48 per cent for all farms reporting in the census. The proportion of the area of the farms here considered in farmsteads, lanes, roads, fence rows, and other obstructions, is approximately equal to the sum of the percentage of land so classified and of land with use not reported in the census.

The relation of size of farms to the proportion of land producing crops is shown in table 34:

TABLE 34. Relation of Size of Farms to Proportion of Land Producing Crops

| | Size of farms (acres) | | | |
|---|---|---|---|---|
| | Less than 100 | 100 to 174.9 | 175 or more | All farms |
| | Per cent of total farm area | | | |
| Land producing a crop: | | | | |
| Crops other than fruit: | | | | |
| Home gardens | 0.28 | 0.27 | 0.11 | 0.17 |
| Other farmstead crops | 0.09 | 0.02 | 0.02 | 0.03 |
| Tenant gardens | 0.07 | 0.10 | 0.18 | 0.14 |
| Permanent meadows | 1.48 | 0.56 | 1.36 | 1.15 |
| Rotated crops | 53.57 | 60.53 | 54.41 | 56.01 |
| Total crops other than fruit | 55.49 | 61.47 | 56.08 | 57.50 |
| Fruit: | | | | |
| Home orchards | 0.50 | 0.57 | 0.43 | 0.47 |
| Tenant orchards | ..... | ..... | 0.02 | 0.01 |
| Other fruit | 18.38 | 7.02 | 3.10 | 5.83 |
| Total fruit | 18.88 | 7.59 | 3.55 | 6.31 |
| Total cultivated crops | 74.37 | 69.06 | 59.63 | 63.81 |
| Permanent pasture: | | | | |
| Cleared pasture | 9.57 | 16.82 | 19.17 | 17.48 |
| Woodland pasture | 5.35 | 3.78 | 12.95 | 9.59 |
| Total permanent pasture | 14.92 | 20.60 | 32.12 | 27.07 |
| Woodland not pastured | 2.35 | 2.13 | 3.25 | 2.84 |
| Total land producing a crop | 91.64 | 91.79 | 95.00 | 93.72 |

TABLE 34 (*concluded*)

| | Size of farms (acres) | | | |
|---|---|---|---|---|
| | Less than 100 | 100 to 174.9 | 175 or more | All farms |
| | Per cent of total farm area | | | |
| Land not producing a crop: | | | | |
| Main farmstead occupied by buildings | 1.99 | 1.11 | 0.71 | 0.96 |
| Land occupied by tenant houses | 0.22 | 0.11 | 0.26 | 0.21 |
| Public roads not in crops | 1.48 | 1.77 | 1.50 | 1.57 |
| Land in cropped fields occupied by: | | | | |
| Fence rows | 1.48 | 1.14 | 1.04 | 1.11 |
| Swampy spots | 0.52 | 0.59 | 0.19 | 0.33 |
| Streams | 0.36 | 0.24 | 0.26 | 0.27 |
| Open ditches | 0.12 | 0.25 | 0.09 | 0.14 |
| Driveways | 0.32 | 0.15 | 0.08 | 0.12 |
| Rough or steep land | 0.26 | 0.24 | 0.05 | 0.12 |
| Land shaded by woods | 0.11 | 0.06 | 0.07 | 0.07 |
| Trees in fields | 0.01 | 0.01 | 0.08 | 0.06 |
| Stone outcrops | 0.12 | 0.01 | ..... | 0.02 |
| Barns in fields | 0.01 | 0.03 | 0.02 | 0.02 |
| Stone piles | 0.01 | 0.02 | 0.02 | 0.02 |
| Total land in cropped fields not producing a crop | 3.32 | 2.74 | 1.90 | 2.29 |
| Lanes not included in pasture or cropped fields | 0.19 | 0.22 | 0.15 | 0.17 |
| Pasture land occupied by streams | 0.01 | 0.58 | 0.16 | 0.26 |
| Land other than pasture or crop land occupied by streams | 1.01 | 0.31 | 0.16 | 0.29 |
| Steep land not in cropped fields | ..... | 0.94 | 0.02 | 0.28 |
| Brushlot | ..... | 0.45 | ..... | 0.12 |
| Unused farmsteads | 0.13 | ..... | 0.07 | 0.05 |
| Village lots | ..... | ..... | 0.07 | 0.04 |
| Total land not producing a crop | 8.35 | 8.23 | 5.00 | 6.24 |

Nearly 94 per cent of the land in these farms was producing some kind of a crop, either field crop, garden, orchard, pasture, or woods. While the value of these different crops varies widely, they are all contributing directly, in some measure, to the farm income. The remainder of the land in these farms, 6.24 per cent, was not producing a crop. Most of this land was not wasted because it was necessary to the proper organization of the business, but it contributed nothing directly to the farm

income. The greater proportion of the land not producing a crop was occupied by obstructions in crop fields, farmsteads, public highways, and tenant houses.

A study of these farms indicates that the area of land suitable for cropping can be considerably increased if conditions warrant. Altho most of the good agricultural land in America is now in farms, the productivity of farms can be greatly increased by a more intensive utilization of land. A proper utilization of land infers not only that as large a proportion of the land as possible shall be productive, but that the land shall be devoted to the purpose which pays best. Farmers are not now making the maximum utilization of their land because it is not profitable to do so.

Some ways of increasing the crop area on the farms studied are pointed out in table 35:

TABLE 35. POSSIBLE INCREASES IN THE CROP AREA OF FIFTY-THREE NEW YORK FARMS

| | Total number of acres | Number of acres per farm | Per cent of total farm area |
|---|---|---|---|
| Public roads on which roadsides could be tilled | 30.00 | 0.57 | 0.33 |
| Woodland not pastured: | | | |
| Tillable if cleared | 151.89 | 2.87 | 1.65 |
| Could be made tillable, after clearing, by drainage | 48.94 | 0.92 | 0.53 |
| Could be made tillable, after clearing, by removing stones | 15.39 | 0.29 | 0.17 |
| Total woodland not pastured that could be tilled | 216.22 | 4.08 | 2.35 |
| Woodland pastured: | | | |
| Tillable if cleared | 395.79 | 7.47 | 4.31 |
| Could be made tillable, after clearing, by drainage | 89.83 | 1.69 | 0.98 |
| Total woodland pastured that could be tilled | 485.62 | 9.16 | 5.28 |
| Cleared pasture other than lanes and paddocks: | | | |
| Tillable | 187.32 | 3.53 | 2.04 |
| Could be made tillable by drainage | 353.19 | 6.66 | 3.84 |
| Could be made tillable by clearing away stones | 292.92 | 5.53 | 3.19 |
| Could be made tillable by clearing away stones and brush | 61.30 | 1.16 | 0.67 |
| Could be made tillable by clearing away stones and by drainage | 132.90 | 2.51 | 1.45 |
| Total cleared pasture, other than lanes and paddocks, that could be tilled | 1,027.63 | 19.39 | 11.18 |

TABLE 35 (*concluded*)

| | Total number of acres | Number of acres per farm | Per cent of total farm area |
|---|---|---|---|
| Fenced driveways not used for stock, which could be tilled | 8.00 | 0.15 | 0.09 |
| Crop land occupied by obstructions: | | | |
| Fence rows | 35.28 | 0.67 | 0.38 |
| Open ditches | 8.35 | 0.16 | 0.09 |
| Streams | 9.85 | 0.19 | 0.11 |
| Swampy spots | 31.00 | 0.58 | 0.34 |
| Stone piles | 1.08 | 0.02 | 0.01 |
| Trees in fields | 5.25 | 0.10 | 0.06 |
| Land shaded by woodlots | 6.68 | 0.13 | 0.07 |
| Rough land | 2.26 | 0.04 | 0.02 |
| Driveways in crop fields | 2.15 | 0.04 | 0.02 |
| Barns in crop fields | 0.75 | 0.01 | 0.01 |
| Total crop land occupied by obstructions, which could be tilled | 102.65 | 1.94 | 1.12 |
| Other land that could be tilled: | | | |
| Brushlot | 11.36 | 0.21 | 0.12 |
| Unused farmsteads | 5.01 | 0.09 | 0.05 |
| Total other land that could be tilled | 16.37 | 0.31 | 0.18 |
| Total land that could be added to crop area | 1,886.49 | 35.59 | 20.53 |
| Present area of all crops | 5,866.75 | 110.69 | 63.83 |
| Possible future area of all crops | 7,753.24 | 146.29 | 84.36 |
| Total area of farms | 9,191.06 | 173.42 | 100.00 |

By rearranging these farms so as to reclaim as much as possible of the land that is now unproductive, about 157 acres could be added to their crop area. This would be an increase of 3 acres of crop land to each farm, or an increase of 2.7 per cent in the crop area. This increase would come out of land which is now unproductive because it is occupied by unnecessary fences, swampy spots, and other obstructions, and would not decrease either pasture or woodland. Probably the land gained would seldom pay for the expense of rearrangement, but the saving of labor is usually more important than the land gained. Where unnecessary stone fences

can be used for improving roads, a threefold saving results: the removal of the stones permits the enlarging of fields and thereby saves labor in growing crops, the improvement of the roads saves labor in marketing the crops, and some land is gained for crop production.

If, in addition to the foregoing changes, all woodland suitable for crop production or for pasture were cleared, about 700 acres could be added to the crop land of these farms without decreasing the effective area of permanent pasture. This would mean an increase of 13.2 acres of crop land to each farm, or an increase of 11.9 per cent of the crop area, but it would decrease the farm wood and lumber supply about 90 per cent. The area of woodland to each farm would be reduced from 21.5 acres to 2.3 acres. In addition to this woodland which is good for no other purpose, some trees might be grown in the pastures.

If as much as possible of the unproductive land on these farms were reclaimed, if all woodland suitable for other purposes were cleared, and if all land suited to crop production were used for that purpose, the area of crop land could be increased about 1886 acres. This would be an increase of 35.6 acres to each farm, or an increase of about one-third in the crop area at the expense of the area of woodland and pasture. As in the preceding case, the area of woodland to each farm would be reduced from 21.5 acres to 2.3 acres, this woodland being suitable for no other purpose. This rearrangement would also reduce by one-half the effective area of permanent pasture, leaving but 17 acres of cleared permanent pasture to each farm. The changes would reduce the farm supply of wood and lumber, and, unless some change were made in the system of farming, would necessitate a reduction in the amount of livestock kept.

Increasing the crop area will mean, not cheaper food, but higher-priced food, because low prices would not justify the expense involved in making these changes. It is better to have more food, even at a higher price, than not to have food when it is needed. Clearing land for cultivation is a long and laborious process. After the trees are cut, it takes about ten to twenty years for the stumps to rot so that the land can be cleared cheaply. In most cases it is better to pasture the land while the stumps are rotting than to clear at once. While, in a general way, the land adapted to crop production will be added to the crop area when conditions justify the addition, the response to these conditions is neces-

sarily slow. At the present time some woodland occupying valuable tillable land is being cut over and will eventually be added to the crop area. Probably there are more farmers who own woodland occupying tillable land too valuable for forestry purposes, who should be thinking about making similar changes.

But land must have another advantage besides being tillable before it will be cropped. It must be near enough to its owner so that it can be cropped economically. Much land now in tillable pasture would be cropped if it were not too remote from its present owner. Such land is usually near enough to some one to be cropped to advantage. Readjustments in ownership which would permit each farmer to farm the land most convenient to his buildings would be desirable from a public as well as from a private point of view. In most cases such readjustments can now be made only with difficulty.

## SUMMARY

This memoir reports the results of a study of the layouts of fifty-three New York farms, the object being to trace the development of farm layouts, to study the principles of efficient farm field arrangements, and to study the utilization of land on these typical farms with particular reference to the possibilities of increasing the area of crop land to meet the needs of an increasing population.

Most of the farm land of New York was originally covered with forests. A large part of this land was divided into farms and cleared for farming when hand-labor methods of agriculture prevailed. Subsequent changes in economic conditions and in methods of agricultural production, and their consequent effect on farms and farming, have given rise to most of the present problems of farm layout. Changes in farm layout have not kept pace with changing agricultural conditions, and as a result most farms now need rearranging. Plans of farms here shown illustrate the historical development of the layout of typical New York farms.

Large crop fields give greater economy of labor, fencing, and land. Hence farmed fields should be as large as the size of farm, the type of farming, the length of rotation, and physical factors, will permit.

For crop fields of ordinary size the oblong shape gives the most efficient use of labor, while the square shape is the most economical of fencing and of land. Saving labor is usually more important than saving land and

fencing, and therefore oblong shapes are most desirable for crop fields of moderate size. Very large crop fields may be square to save fencing, and yet be long enough to permit the efficient use of labor.

The distance from farmstead to fields should be made as short as possible in order to save useless travel. With farms of moderate size the farmstead should be located as near the center of the farm as it can be placed and still be on the highway. The ideal arrangement is to have half of the land on each side of the highway, with the buildings in the center of the farm.

Crop fields should be free from obstructions, such as swampy spots, open ditches, streams, trees, stone piles, and unnecessary fences.

The question of fencing farms suitably and economically is becoming increasingly important. Data are herein presented showing the amount of each kind of fencing found on these farms, the adaptation of fencing practice to local conditions in different parts of the State, the distribution of fence on farms, the proportion of farm division lines that are fenced, the relation of size of farm to economy of fencing, the amount of land occupied by fences, the proportion of the farm area inclosed by fence, and the farm cost of fence maintenance.

Farm lanes and driveways should be carefully planned for efficiency of labor, fencing, and land. The area of land utilized in lanes on the farms studied is given, as well as the average width of lanes with different amounts of stock.

The proper utilization of farm land is also important. Data are presented showing the amount of land in cropped fields occupied by fences, swampy spots, streams, and other obstructions, and by different classes of crops, on the farms studied, the relation of size of farms to the proportion of the area of cropped fields occupied by obstructions, the classification of pasture land, the relation of size of pastures to economy of fencing, the classification of woodland, and the present use of land in highways and farmsteads.

Many farm plans are given illustrating desirable and undesirable features of farm layouts. These plans emphasize the fact that most farms need rearranging to adapt them to present conditions.

In addition to the preceding factors, physical features such as soil, drainage, and topography should also be considered in planning a farm layout.

The logical procedure in planning the rearrangement of a farm is:

1. To study carefully the farm and the local conditions.
2. To decide on the cropping plan or rotation.
3. To make a plan for the long-time development of the farm which will provide as good a layout for the conditions as the natural limitations permit.
4. To carry out plans slowly, doing the work at odd times; to do the most important things first; not to let this work interfere with work on crop production.

Plans are included in the bulletin illustrating different stages in the actual rearrangements of some New York farms as made by owners, and possible rearrangements of other farms which have been started but are not yet completed. These plans are accompanied by descriptions of the farms, of local conditions, and of the procedure followed in carrying out the plans for rearrangement.

A complete inventory of the land on these farms is given, showing the present use of all land. Data are presented comparing the use of land on these farms with that on the average New York farm, and also showing possible increases in the crop area of the farms studied by reclaiming land now unproductive and by utilizing for crops land which is now occupied by pasture or woods but which would be suitable for crop production. If the farms studied may be considered as typical, substantial increases can be made in the crop area of New York farms to meet the prospective needs of an increasing population.

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